25 January 2012

Addendum to the *Free-Phase Petroleum Hydrocarbon Investigation Report*
Former CENCO Refinery
12345 Lakeland Road, Santa Fe Springs, CA

SLIC No. 0318, ID No. 2040071
CAO 97-118

Prepared on Behalf of

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Prepared for

Regional Water Quality Control Board
Los Angeles Region

Prepared By

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I, Michael Barranco, do hereby declare, under penalty of perjury under the laws of the State of California, that I am the Environmental Coordinator for Lakeland Development Company, that I am authorized to attest to the veracity of the information contained in the report described herein, and that the information contained in

Addendum to the FPPH Investigation Report, dated January 25, 2012

is true and correct, and that this declaration was executed at Lakeland Development, in Santa Fe Springs, California on January 25, 2012

Signed,

Michael Barranco

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1. INTRODUCTION

On behalf of Isola Law Group, LLP, Murex Environmental (Murex) has prepared this addendum to the *Free-Phase Petroleum Hydrocarbon* (FPPH) *Investigation Report* for the Lakeland Development Company (Lakeland) for its former refinery located at 12345 Lakeland Road in Santa Fe Springs, California (site; **Figure 1**).

The Regional Water Quality Control Board, Los Angeles Region (RWQCB) requested a free-phase petroleum hydrocarbon (FPPH) investigation in a letter dated April 3, 2007 to enhance delineation of the FPPH plume. ARCADIS prepared a workplan to conduct a FPPH investigation which was submitted to the RWQCB August 2007. The workplan was subsequently approved. The investigation approach prescribed the use of the Rapid Optical Screening Tool (ROST) to evaluate the presence of FPPH. ARCADIS completed nine of the original 12 proposed locations (three locations were inaccessible on the property of the Metropolitan State Hospital due to construction at that time) and presented the findings to the RWQCB.

In 2010, the RWQCB issued a letter to Lakeland Development Company titled, "Requirements for Subsurface Investigation and Cleanup Pursuant to Cleanup and Abatement Order No 97-118, Former Powerine/CENCO Refinery" (**Appendix A**). Murex submitted a workplan to complete the FPPH investigation titled *"Regulatory Update – FPPH Investigation Status*," which was approved by the RWQCB in a letter dated February 15, 2011 (**Appendix A**).

The *Free-Phase Petroleum Hydrocarbon* (FPPH) *Investigation Report* was submitted to the RWQCB on June 30, 2011. This report summarized the findings of the historical ARCADIS investigation combined with the findings of the work performed since that time, including a summary of FPPH investigation methods, results, and findings.

Subsequent to the submittal of the FPPH Investigation Report, and during the third quarter 2011 groundwater monitoring event, free product was discovered for the first time in well W-15A, located at the furthest southern extent of the Lakeland monitoring well network (see **Figure 2**). Murex notified the RWQCB about this discovery in an email sent on August 30, 2011 to the CENCO case manager, Don Indermill (**Appendix A**). At that time, Mr. Indermill requested that a petroleum hydrocarbon fingerprint analysis be conducted on the free product sample from W-15A to determine its characteristics and that an addendum to the FPPH Investigation Report be prepared and submitted for RWQCB review. For comparison purposes, FPPH samples taken from other groundwater monitoring wells were

also subjected to a fingerprint analysis. This addendum summarizes the data and findings of the follow-on work performed pursuant to the FPPH investigation.

1.1 Purpose

The main objective of the FPPH forensics investigation was to gather additional qualitative data on the FPPH discovered in well W-15A in the context of other FPPH measured throughout the Lakeland monitoring well network historically. Moreover, to better clarify whether the FPPH in W-15A could possibly be tied to a release from the former CENCO/Powerine Site, or whether it is more likely resultant from a release or releases located elsewhere.

2.0 SITE BACKGROUND

Site description, facility operational history, and site geology and hydrogeology are presented in the following subsections.

2.1 Site Description and History

The site is approximately 55 acres in size and is bordered to the north by Florence Avenue, to the south by Lakeland Road, and to the east by Bloomfield Avenue (**Figure 1**). The Site is bordered on all sides by commercial and industrial properties. The site was operated as an oil refinery from the 1930s until July 1995. Historical aerial photographs indicate that the western portion of the site may have been used for agricultural purposes from approximately 1928 to 1938. Oil-production-related structures such as ponds and aboveground holding tanks may have also been located onsite during these years (Haley & Aldrich, Inc. [Haley & Aldrich], 2005). The refinery is not currently in operation; however, some of the refinery structures remain onsite. These structures are scheduled to be removed prior to the redevelopment of the property for commercial/industrial use.

Previous refining operations included processing crude oil into several grades of fuel including kerosene, leaded gasoline and aviation fuel, unleaded gasoline, jet fuel, high and low-sulfur diesel, fuel oil, and petroleum coke. Soil and groundwater quality beneath and in proximity to the site have been impacted by past site operations. Soil and groundwater investigations are being conducted pursuant to a Cleanup and Abatement Order (CAO), No. 97-118 issued by the RWQCB to Powerine Oil Company (CENCO Refining Company) in 1997 (Haley & Aldrich, 2005).

2.2 Geology and Hydrogeology

2.2.1 Regional Geology and Hydyrogeology

The site is located within the Santa Fe Springs Plain Subgeomorphic Province of the Los Angeles Coastal Plain at an elevation of approximately 130 to 140 feet (ft) above mean sea level (amsl). This plain is a slightly rolling topographic feature sloping gently to the northeast in the vicinity of the site due to the northwest trending Santa Fe Springs–Coyote Hills anticlinal system. The site is positioned above the southern limb of the Santa Fe Springs Anticline. Petroleum accumulation associated with this anticlinal structure has resulted in substantial oil production in the Santa Fe Springs area. Prominent topographic features in the area include the Puente and Coyote Hills to the northeast, east, and southeast (**Figure 1**). The San Gabriel River is located approximately 1.75 miles west of the

site and flows from north-northeast to south-southwest (**Figure 1**; Haley & Aldrich, 2005; Versar, 2000).

Several regional water-bearing units have been identified within the older alluvial fan and valley deposits of the Lakewood Formation and underlying San Pedro Formation. In the site area, the Lakewood Formation begins at ground surface, ranges from 100 to 180 ft thick, and is contains three hydrostratigraphic units: 1) the Bellflower Aquiclude (upper unit), 2) the Exposition Aquifer, and 3) the Gage Aquifer. The Exposition and Gage aquifers consist predominantly of sands and fine gravels with discontinuous, thinly bedded silts and clays. These aquifers have an approximate combined thickness of 100 to 150 ft, approximately half of which is saturated (Versar, 2000).

Within the site vicinity, the Bellflower Aquiclude consists of a heterogeneous mixture of clays, silty clays, silts, and extensive interbedded lenses of sandy or gravelly silts and clays and has an estimated thickness between 20 and 40 ft. The major water-bearing unit of interest for this investigation is the Exposition Aquifer (otherwise known as the Artesia Aquifer), the upper water bearing unit of the Lakewood Formation. The Exposition Aquifer is composed of coarse gravel, coarse to fine sand, and interbedded silts and clays with a general southwesterly dip and thickness between 40 and 80 ft. The Exposition Aquifer is separated from the Gage Aquifer by an unnamed aquiclude. Based on boring logs from the installation of monitoring wells MW-14 A/B/B, MW-15 A/B/C, and MW-16 A/B/C, this aquiclude appears prominently between approximately 130 ft bgs to 170 ft bgs (elevation 0 to -40 ft-amsl).

Information for the site area in Santa Fe Springs indicates that the depth to first-encountered groundwater within the Exposition Aquifer ranges from 75 to 90 ft bgs. The Gage Aquifer consists predominantly of sands and fine gravels with an estimated thickness between 30 and 60 ft (Department of Water Resources [DWR], 1961; Versar, 2000; Haley & Aldrich, 2005).

2.2.2 Local Geology and Hydrogeology

Previous (Haley & Aldrich, 2005, Blasland, Bouck & Lee, Inc. [BBL], 2006; ARCADIS, 2009) subsurface investigations conducted at the site confirm that the lithology is a vertically and laterally heterogeneous mélange of alluvial deposits. Underlying a shallow surface layer of fill and roadbase materials at the site are interbedded alluvial sediments ranging in texture from poorly graded sands through fat clays. In general, the eastern portion of the site contains more coarser-grained sediments (sand and gravel) than the western portion of the site.

3.0 SUMMARY OF PREVIOUS FPPH INVESTIGATION

The following section summarizes the findings of the previous FPPH investigation performed by Arcadis between 2005 and 2009 and the investigation conducted by Murex in 2011.

3.1 Previous FPPH Investigations

FPPH was first detected in well MW-504, on June of 1988, with approximately 1.83 feet of thickness. Between that discovery and the year 2007, FPPH was measured in 19 other wells including: MW-101, MW-103, MW-104, MW-201, MW-202, MW-203, MW-204, MW-205, MW-206, MW-501, MW-502, MW-503, MW-504, MW-600, MW-600A, MW-601, MW-601A, W-3A, AND EW-1.

In 2007, ARCADIS prepared a workplan to conduct a FPPH investigation and enhance FPPH plume delineation in response to a letter from the RWQCB dated April 3, 2007. ROST was proposed as the method for measuring FPPH presence on-Site and on properties located downgradient of the Site.

3.2 2010/2011 FPPH Investigation

On July 21, 2010, the RWQCB issued an order letter to Lakeland to provide an update on the FPPH investigation and a schedule for its completion. Murex Environmental submitted to the RWQCB, on behalf of Lakeland, the *Free Phase Petroleum Hydrocarbon Investigation Status Report*, dated September 3, 2010. Included with the report was an Addendum to the FPPH Work Plan, previously approved on January 11, 2008. This FPPH Work Plan Addendum proposed to perform continuous coring during new monitoring well installations, to complete the Arcadis ROST investigation and reposition FPB-09, and to perform FPPH bail down tests on wells exhibiting product. The FPPH Work Plan Addendum was approved on February 15, 2011 (**Appendix A**). After investigation activities were completed, Murex submitted a final report of findings to the RWQCB in the *Free-Phase Petroleum Hydrocarbon* (FPPH) *Investigation Report* on June 30, 2011.

3.3 FPPH Investigation Conclusions

Results from the visual inspections and ROST investigations did not indicate the presence of free product in the areas where Lakeland monitoring wells contained FPPH, as exhibited by well gauging measurements. Furthermore, the bail-down testing resulted in a very low recovery rate. As a result, Murex concluded that free phase petroleum hydrocarbon is present in the subsurface beneath and down-gradient of the former CENCO facility (in the vicinity of monitoring wells MW-503B and MW-708; however, the quantity has decreased

and the majority of it is suspended in the unsaturated and capillary fringe zones.) It is likely that the ability of the FPPH to leach into the groundwater will continue to dissipate over time as the material biodegrades. Strong evidence of biodegradation, such as high methane concentrations in deep soil gas, indicates that this effect is occurring.

Further, the FPPH investigation confirmed earlier assumptions that off-Site sources of FPPH exist, as evident by the characteristics of FPPH recovered in well EW-1.

4.0 FPPH SAMPLING AND FORENSIC ANALYSIS TESTING PROCEDURES

4.1 Sampling and Field Testing Activities

4.1.1 Free Product Sampling and Storage

Between December 8, 2010 and September 7, 2011, free product samples were collected from wells MW-503B, W-11, VE-2A (an on-Site vapor extraction pilot test well located within the east tank farm) and MW-708 during previous monitoring activities. These samples were stored at Murex's offices, located in Tustin, California. Samples were then also taken from W-15A and EW-1 on September 14, 2011.

The FPPH samples were collected before or several days after purging (for groundwater sampling) was conducted, so as to represent relative "steady-state" condition. Samples were collected by lowering and retrieving a disposable plastic bailer and pouring the material into laboratory containers free of preservative.

The samples were stored indoors in sealed glass jars and retained under chain of custody. There is no hold time before which petroleum hydrocarbon free product samples must be forensically tested in order to remain viable. Further, there was no need to store the samples on ice or with added preservatives before testing. The samples collected were considered appropriate for testing by Zymax Forensics (Zymax), the laboratory which conducted the forensic analysis. All six free product samples were sent to Zymax for analysis.

4.1.2 Additional Bail Down Tests

As a part of the third and fourth quarter 2011 groundwater sampling events, new bail down tests were conducted on wells W-15A and EW-1 for the purposes of determining the recharge rate of FPPH in the wells. Results for these tests can be found in **Table I**.

A bail-down test is conducted as follows:

- Prior to purging, the depth to and the thickness of the FPPH is determined using an oil-water interface probe.
- A vacuum stinger is used to purge liquid from the top of the groundwater table. The stinger is lowered as FPPH is depleted. At least three casing volumes in each well were purged.
- FPPH thickness was measured after the purge for several measurements, with each measurement taken after a successively longer wait time.

4.2 Forensic Fingerprinting Analysis

The six FPPH samples were received by Zymax on September 21, 2011. Chain of custody records can be found with the final completed report submitted by Zymax (**Appendix B**). The following three analyses were performed on the samples:

1. C_3-C_{44} whole oil analysis by GC/FID (Gas Chromatograph/Flame Ionization Detector), ASTM D3328
2. Ethylene Dibromide (EDB) / Methylcyclopentadienyl Manganese Tricarbonyl (MMT) / Organic lead speciation by GC/ECD (Electron Capture Detector)
3. Oxygenate blending agents by EPA 1625 Modified

The results of these tests are shown in **Table II**. The first analysis, C_3-C_{44} whole oil analysis by GC/FID (ASTM D3328) tests for the presence of up to 149 compounds between gasoline and oil. Various types of petroleum products and crude oils can be identified through this analysis, which involves injecting samples into a gas chromatograph so that carbon chain fractions can be separated and quantified.

Lead compounds were added to gasoline beginning in the 1920s through the 1970s, and allowed octane ratings to be boosted significantly, increasing power and fuel economy. Different leaded compounds were in use over that time period. Thus, they are indicator compounds which can distinguish older gasoline releases from those that are more recent. Organic lead speciation determines quantities of five alkyl lead compounds. It also quantifies ethylene dibromide (EDB) and methylcyclopentadienyl manganese tricarbonyl (MMT), a manganese additive. In this procedure, samples are injected into a GC and an ECD is used to detect the presence of the compounds.

EPA 1625 modified quantifies the oxygenated additives in the samples tested. These include methyl tert-butyl ether (MTBE), diisopropyl ether (DIPE), ethyl tert-butyl ether (ETBE), tert-amyl methyl ether (TAME), tert-buyl alcohol (TBA) and ethanol. This data is useful in determining the age of the any unleaded gasoline in the samples, since oxygenated additives were in use in the refining business over different time periods. In this analysis, the samples are frozen in liquid nitrogen, then warmed through the addition of distilled water to the sample. During this process, fuel oxygenates are separated and analyzed by GC.

Due to the relatively high detection limits of EPA 1625, data from historical samples of groundwater from the wells in this study was also considered. The results from groundwater samples taken from these wells as a part of the quarterly groundwater

monitoring program are analyzed for EPA 8260B, which includes reporting of MTBE, TBA, DIPE, and ETBE. The detection limits for 8260B are significantly lower, and although the samples are not of FPPH itself, the presence or absence of these oxygenate compounds in the test wells can supplement the study as useful data. The results of the historical oxygenate analysis are shown in **Table III**.

5.0 RESULTS AND DISCUSSION

The following section summarizes the findings of the FPPH study, which includes information from the Zymax report (**Appendix B**). Analytical results can be found in **Table II**.

5.1 Physical Inspection

Based on a visual inspection of the FPPH samples performed during sampling, the following observations were noted:

- The material sample from VE-2 was collected as a condensed liquid within vapor extraction tubing connected to the test well VE-2A. It had a clear, silky appearance like that of mineral oil and only a slight petroleum odor.

- The sample from EW-1 was a black, viscous fluid with the appearance of dirty or used motor oil or crude oil, with a strong, foul odor of degrading petroleum.

- The sample from W-11 was yellow and free flowing with a medium viscosity, such as that of clean, unused motor oil or naptha with a strong fresh petroleum odor.

- The sample taken from MW-708 was cloudy and amber, with the appearance of an emulsion, such as how a salad dressing would appear after being shaken. The petroleum odor was strong, but also foul, as if anoxic.

- The sample taken from well MW-503B was solid-colored dark brown material, free-flowing, with a medium viscosity. The material was not translucent. It exhibited a strong petroleum odor.

- The sample taken from W-15A was a yellowish-brown, free-flowing, low viscosity material that was clean in appearance (i.e., translucent) that would suggest it had not been present in groundwater as long as other samples exhibiting a cloudy or dirty appearance. It exhibited a strong petroleum odor.

5.2 Bail-Down Test Results

Bail-down tests were conducted on wells W-15A and EW-1. FPPH in these wells returned within the same day they were tested. A summary of the FPPH measurements gathered during the bail-down tests can be found in **Table I**.

Measurements of FPPH before and after purging by stinger were taken in W-15A during the third and fourth quarter monitoring events. The measurements varied across the two monitoring events, but in both cases, approximately 1 to 2 feet of FPPH recharged into the well within one day.

The recovery rate for EW-1 was significantly faster that when it was tested in February 2011, as a part of the previous FPPH investigation. During that test, it took several days before a measureable amount of FPPH was detected. During the test conducted in November 2011, the well recharged to greater than one foot of FPPH in one day.

The increases in FPPH recharge rate could be a result of an increasing water table elevation (which collects FPPH in the soil matrix deposited there during years of dropping water table elevation), or could indicate an increase in FPPH quantity from a source in the vicinity of the well.

5.3 C_3-C_{44} whole oil analysis by GC/FID

The output of a C_3-C_{44} whole oil analysis test is a chromatogram which identifies relative quantities of various hydrocarbon compounds. The presence of certain compounds and the ratios at which they are found can provide insight into the formulation of the product(s). Further, the retention time exhibited by a test specimen can indicate the range of carbon chain size of the components of the sample.

5.3.1 Retention Time/GC Peaks

The FPPH sample taken from the pilot test vapor extraction well VE-2A had a hydrocarbon distribution unique from any of the other 5 samples. It was composed of approximately 97% aromatic molecules. A small portion of the compounds are located in the C_{10} to C_{16} range, indicating the possible presence of kerosene, however the majority of the mixture is found at 72 to 76 minutes retention time, in the higher carbon range. These compounds are unable to be identified through GC/FID analysis. An analysis using GC/MS (mass spectrometry) would be required to identify these compounds.

Sample EW-1 is a mixture of isoparaffinic, aromatic, and napthenic compounds, with a small olefinic content. It shows no presence of iso-octane and exhibits low BTEX concentrations, indicating that there is no gasoline in the sample. Volatile and heavier hydrocarbons are present, which could indicate a degraded naphtha and/or mixture of middle-weight distillates. Alternatively, the presence of n-alkanes in the FPPH from well EW-1 could indicate that the sample contains a heavier crude oil has been degraded over time, which is consistent with the FPPH's appearance and odor.

Sample W-11 is made up of a wide array of petroleum compounds, including paraffinitic, isoparaffinitic, aromatic, and napthenic groups. It exhibits low concentrations of gasoline-related compounds, such as xylenes or trimethylbenzenes, indicating that there is no gasoline in the samples. The distribution of volatile products from C_4 to C_{12} is indicative of naphtha.

The sample from well MW-708 has peaks that can be placed into three groups. The first is in the gasoline range between C_6 and C_9. The second, represented by a grouping between C_{12} and C_{23}, is present without much weathering, and indicates the presence of a middle distillate such as #2 diesel or #2 fuel oil. Lastly, a third grouping exists between the two, which based on a gas chromatograph (GC) retention time ranging from 30 minute to 45 minutes, indicating hydrocarbons from C_9 to C_{12}. Based upon an examination of the characteristics, these compounds represent a light distillate, such as Stoddard solvent, which is slightly weathered.

The sample from well MW-503B contained mainly gasoline, with only a very minor portion of a higher weight grouping in the C_{12} to C_{23} range, indicating the trace presence of a #2 diesel or #2 fuel oil.

The sample from MW-15A was also mainly gasoline, and also contained a very minor portion of higher weight grouping in the C_{12} to C_{23} range, indicating the trace presence of a #2 diesel or #2 fuel oil.

The FPPH samples from MW-503B, MW-708 and W-15A contain numerous n-alkanes as well, indicating that the diesel/fuel oil content of the samples remains relatively unweathered.

5.3.2 Pristine/Phytane

The ratio of pristine to phytane in a sample is a characteristic resultant from the parent crude oil from which the fuels are refined. Through the refining process, this ratio remains relatively unaltered. It can therefore be used to differentiate middle distillates refined from dissimilar crude oils. **Table II** contains the ratios of pristine/phytane for all samples.

MW-708 has a pristine/phytane ratio of 2.2, EW-1 has a ratio of 2.3, and W-15A has a ratio of 2.1. These similar ratios suggest that the diesel/fuel oil products in MW-708, EW-1, and W-15A were derived from the same or similar crude oil. The pristine/phytane ratio in MW-503B is 1.2, as compared to MW-708 and W-15A, indicating that the diesel/fuel oil

products in this sample were derived from an altogether different crude oil than that of the three aforementioned wells.

That said, it is not surprising to see similarly-sourced crude oil across a wide time span in Los Angeles and Orange counties, since oil production has been ubiquitous in the area since the early twentieth century. It stands to reason that most oil refined here would be sourced here. Because of this phenomenon, the pristine/phytane ratio yields little definite information in this setting.

5.3.3 Octane

2,2,4-trimethylpentane (iso-octane) is a compound blended into gasoline as part of an alkylate refinery stream, and is an indicator that a product is indeed gasoline, versus some other refinery product. It was found in samples MW-503B, MW-708 and W-15A, indicating that these samples contain at least partially gasoline. Samples from wells VE-2, W-11, and EW-1 did not contain iso-octane.

The ratio of iso-octane to methylcyclohexane in a sample can be used to identify different types or mixtures of gasoline. Both MW-708 and W-15A have an iso-octane/methylcyclohexane ratio of 0.2. This indicates that the two samples may contain, at least partially, a similar gasoline product (or a similar mixture of different gasoline types). These two samples are both different from MW-503B, which has an iso-octane/methylcyclohexane ratio of 1.8. This indicates that the gasoline portion of sample MW-503B exhibits different characteristics than that found in MW-708 and W-15A.

Admittedly, the "similarity" of the gasolines in MW-708 and W-15A may only narrow their commonality down to a wide period of several decades, since similar gasolines were produced in California for long periods of time. The C_3-C_{44} test results can be found in **Table II**, highlighted in green.

5.4 EDB/MMT/Organic Lead Speciation by GC/ECD

EDB/MMT and organic lead speciation results are indicated in red on **Table II**. Samples from EW-1, W-11 and VE-2A were non-detect for all lead compounds able to be identified through this test: EDB, MMT, tetramethyl lead (TML), trimethylethyl lead (TMEL), dimethyldiethyl lead (DMDEL), methyltriethyl lead (MTEL), tetraethyl lead (TEL).

MW-503B, MW-708 and W-15A all indicate the presence of TMEL, DMDEL, MTEL and TEL. In all three samples, MTEL is found at the highest levels, ranging from 202.6 mg/L in MW-

503B to 496.8 mg/L in W-15A. This indicates that the material in these wells likely contains some portion of leaded gasoline.

Historically, there were a variety of alkyl lead compound mixtures added to gasolines, each with its unique compound ratio signature (Gibbs, 1997). The similar ratio of these alkyl lead compounds in all three samples indicates that the same alkyl lead compound mixture may have been added to the leaded gasoline that is present in all three samples. This alkyl lead mixture was first used in 1960, and lead concentrations in the gasoline in the samples suggest that they derive from gasolines in prevalent commercial use prior to 1985.

5.5 6 oxygenate blending agent by EPA 1625 Modified

All samples tested were below laboratory detection limits for all six unique fuel oxygenates: MTBE, ETBE, DIPE, TAME, TBA and ethanol. Fuel oxygenate results are indicated in blue on **Table II**. None of these compounds were detected in the six FPPH below their laboratory detection limits, which were between 10 mg/kg and 100 mg/kg.

These compounds, however, were likely present at concentrations below the laboratory detection limits. We know this because historically, groundwater sampling at the site has shown that several of these compounds have been present for one or more monitoring events. **Table III** contains the historical analytical data for MTBE, TBA, DIPE and ETBE, the four oxygenates tested as part of the EPA 8260 analysis conducted for quarterly groundwater monitoring at the site. While DIPE and ETBE have not historically been detected in any of the test wells, MTBE and TBA exhibited several historical detections.

The oxygenate MTBE and TBA, a common break-down product of MTBE, can indicate three different characteristics of petroleum contamination. First, the oxygenate MTBE was widely used in California between the years 1980 and 2003. Therefore, gasoline discovered in groundwater that contains MTBE can be attributed to a release date during this time period.

Second, MTBE and TBA are more soluble than most of the components found in gasoline, and exhibit a lower retardation. Therefore, once released to groundwater, more MTBE and TBA can be found at the “leading” or distal edge of a gasoline plume than in the center (i.e., other gasoline components spread more slowly along the groundwater flow path). Because of this, MTBE and TBA can sometimes be considered leading indicators of a higher concentration gasoline plume located upgradient.

Lastly, since MTBE degrades to TBA over time, the ratio of TBA to MTBE can indicate (in qualitative terms) how long a gasoline release has been present in groundwater and/or how far the measurement point is from the source of the release. Generally, however, this last characteristic is only useful when studying a singular plume from a singular known release. The Site vicinity apparently exhibits multiple sources and multiple releases which have occurred over different time periods, and therefore, the ratios of TBA to MTBE in each well are difficult to put into context.

Between January 2000 and November 2011, the maximum MTBE level detected in MW-503B was 9.6 µg/L. EW-1 historically exhibited no detections of MTBE between August 1998 and April 2011, with low detections of TBA (maximum detection of 31 ug/L in February 2008). Similarly, well W-11 exhibited only a single sample over a period from November 2006 to November 2011 that exhibited the presence of MTBE and TBA, at a concentration of 17 ug/L and 43 ug/L, respectively. These results, as well as the lack of MTBE or TBA in the samples retrieved from VE-2 and EW-1, are consistent with the results of the C_3-C_{44} whole oil analysis test, which indicated the FPPH found in these wells was not gasoline.

However, MTBE and TBA levels in MW-708 are much greater, ranging from 330 to 2,300 µg/L and at 2,500 ug/L, respectively, in the time since it was installed in January 2011. Groundwater samples collected from well MW-15A have historically exhibited MTBE concentrations ranging between 2.5 ug/L and 650 ug/L. TBA concentrations in MW-15A have ranged between non-detect to 390 ug/L.

Based on the oxygenate compound content of the FPPH samples, wells MW-708 and W-15A both likely contain gasoline that was refined during the period of MTBE use (i.e., between 1980 and 2003).

6.0 SUMMARY

Six free product samples were collected from wells MW-503B, EW-1, W-11, VE-2A, MW-708 and W-15A between December 2010 and September 2011. These six samples were analyzed using petroleum hydrocarbon fingerprinting techniques by Zymax Laboratories.

Many unique products were identified. These are outlined below by the well in which they are found.

- EW-1: The most likely identity of the FPPH in well EW-1 is a degraded crude oil. The origin is unknown, but based on the groundwater gradient direction, it could be to the north-northeast.

- W-11: The major constituent in W-11 is naphtha. It's origin is most likely the west tank farm of the former refinery.

- MW-503B: This well contains a weathered leaded gasoline (herein referred to as gasoline type "A"), which is the major product. The minor constituent found in the sample is a fresh relatively unweathered diesel (herein referred to as diesel type "A") or #2 fuel oil. The origin of the gasoline type A in well MW-503B is likely a release of gasoline between the 1960 and 1985 from the southwest area of the former refinery.

- MW-708: As many as four major products are found in this well. First, a light distillate is found which may be mineral spirits or Stoddard solvent. Secondly, two types of gasoline are likely present. First, a leaded gasoline is present, likely produced between 1960 and 1985. The presence of MTBE and TBA also is indicative of a second gasoline, a more modern product, produced between 1980 and 2003, herein described as gasoline type "B". The presence of the second gasoline type makes it impossible to determine if the iso-octane/methylcyclohexane ratio of 0.2 indicates that the leaded gasoline component is different from the leaded gas found in MW-503B or if the ratio is simply being affected by the presence of the more modern gasoline, which is likely present in greater abundance. The fourth major constituent found in MW-708 is relatively unweathered diesel (herein referred to as type "B"). From the appearance and odor of the FPPH sample, the mixture is highly weathered and its degradation has made the groundwater in the vicinity anoxic.

- W-15A: This well contains a small portion of weathered leaded gasoline, likely produced between 1960 and 1985. The presence of MTBE and TBA also is indicative of a second gasoline, a more modern product produced between 1980 and 2003, herein described as gasoline type "B". The presence of the second gasoline type makes it impossible to determine if the iso-octane/methylcyclohexane ratio of 0.2 indicates that the leaded gasoline component is different from the leaded gas found in MW-503B or if the ratio is simply being affected by the presence of the more modern gasoline. A minor constituent also found in this sample is a relatively unweathered diesel type B. The visual characteristics of this FPPH indicate that the overall mixture is less weathered than samples from MW-503B and MW-708. The significance of this observation can be that 1) the more modern gasoline is the most prevalent component (i.e., comprising the majority of the product by volume) and this degree of weathering is consistent with a more modern gasoline from the era of oxygenate use, 2) that the FPPH has not been in the environment for a significantly long period, and/or 3) that the source of release is in the near vicinity. At this time, the likely release location is unknown.

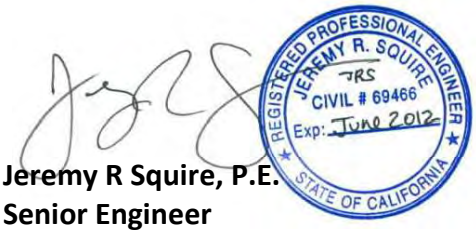
- VE-2A: The compounds found in VE-2A are unknown. They do have high molecular weights, and must exhibit a vapor pressure high enough to evaporate under vacuum extraction, since the material condensed inside of a vapor extraction system hose. These compounds could be identified through the use of GC/MS analysis.

7.0 CLOSING

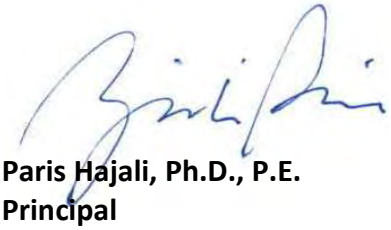
I certify under penalty of law that this document and all enclosures were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. The information contained herein is, to the best of my knowledge and belief, true, accurate and complete, however, is reliant upon public agency records, which could be incomplete or inaccurate beyond our control.

Should you have any questions or concerns regarding the material herein, please do not hesitate to contact the undersigned at (714) 508-0800.

Sincerely,
MUREX ENVIRONMENTAL, INC.



Jeremy R Squire, P.E.
Senior Engineer



Paris Hajali, Ph.D., P.E.
Principal

8.0 REFERENCES

1. ARCADIS, 2007. *Supplemental Soil Investigation Workplan, Former CENCO Refinery, 12345 Lakeland Road, Santa Fe Springs, California.* Prepared for Isola Law Group, LLP. August 31.

2. ARCADIS. 2009. *First Quarter 2009 Groundwater Monitoring Report, Former CENCO Refinery, 12345 Lakeland Road, Santa Fe Springs, California.* Prepared for Isola Law Group, LLP. May 1.

3. BBL, an ARCADIS Company (BBL). *Additional Site Investigation Report, Former CENCO Refinery* (August 2006).

4. California Division of Mines and Geology (CDMG) Open File Report 99-04. Geologic *Map of the Whittier Quadrangle 7.5 Minute Topographic Map, Los Angeles and Orange Counties, California, Version 1.0.* (1999).

5. California Department of Water Resources (DWR). Bulletin No. 104, June 1961, Reprinted May 1988. *Planned Utilization of the Ground Water Basins of the Coastal Plain of Los Angeles County, Appendix A Groundwater Geology.*

6. Haley & Aldrich, Inc. 2005. Additional Site Investigation Workplan, Cenco Refining Company, 12345 Lakeland Road, Santa Fe Springs, California. Prepared for Isola & Bowers, LLP. May 9.

7. Versar, 2000. *Revised Master Workplan,* CENCO Refining Company, Santa Fe Springs, CA. January 2000.

8. Gibbs, J.M., 1997. *Gasoline Additives – When and Why in History of Aircraft Lubricants,* Society of Automotive Engineers, SP-1272. Pp. 125-145.

Table I
Summary of FPPH Measurements
Former CENCO Refinery
Santa Fe Springs, CA

Location	Date	Time	DTFP	DTW	FP Thickness
			Feet	Feet	Feet
W-15A	8/23/11	15:00	111.87	113.9	2.03
W-15A	8/25/11	16:30	111.88	116.73	4.85
W-15A	8/26/11	15:38	111.91	116.71	4.80
W-15A	8/29/11	17:00	111.93	116.47	4.54
W-15A	8/30/11	15:21	111.93	116.45	4.52
W-15A	8/31/11	16:26	111.97	116.35	4.38
W-15A	9/1/11	17:00	112.00	116.26	4.26
W-15A	9/2/11	17:40	112.03	116.15	4.12
W-15A	11/9/2011	16:09	NA*	111.82	NA*
W-15A	11/10/2011	11:28	111.63	112.55	0.92
W-15A	11/14/2011	17:20	111.62	112.49	0.87
W-15A	11/16/2011	16:38	111.61	112.37	0.76
W-15A	11/17/2011	17:30	111.58	112.29	0.71
W-15A	11/18/2011	17:50	111.58	112.29	0.71
W-15A	11/21/2011	17:23	111.54	112.32	0.78
W-15A	11/22/2011	14:29	111.57	112.20	0.63
W-15A	11/23/2011	12:00	111.55	112.22	0.67
EW-1	11/17/2011	17:21	105.87	107.43	1.56
EW-1	11/18/2011	18:00	105.82	107.78	1.96
EW-1	11/21/2011	17:35	105.89	108.04	2.15
EW-1	11/22/2011	14:42	105.77	107.80	2.03
EW-1	11/23/2011	12:23	105.78	107.85	2.07

NOTES:
DTFP - Depth to Free Product
DTW - Depth to Water
FP - Free Product
NA - Data Not Available
* - May not have entered into stinger

Santa Fe Springs, CA

Date	TAME	TBA	DIPE	Ethanol	ETBE	MTBE	EDB	TML	TMEL	DMDEL	MTEL	TEL	MMT	Iso-octa /methylcyclo Ratio
	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
4/2011	<100	<10	<100	<10	<50	<50	<0.5	<5	<5	<5	<5	<5	<5	0
8/2010	<100	<10	<100	<10	<50	<50	<0.5	<5	<5	<5	<5	<5	<5	0
4/2011	<100	<10	<100	<10	<50	<50	<0.5	<5	**43.6**	**215.9**	**496.8**	**106.7**	<5	**0.2**
4/2011	<100	<10	<100	<10	<50	<50	<0.5	<5	**20.4**	**83.1**	**202.6**	**34.3**	<5	**1.8**
6/2011	<100	<10	<100	<10	<50	<50	<0.5	<5	**48.3**	**181.6**	**351.1**	**58.5**	<5	**0.2**
7/2011	<100	<10	<100	<10	<50	<50	<0.5	<5	<5	<5	<5	<5	<5	NA

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Ether
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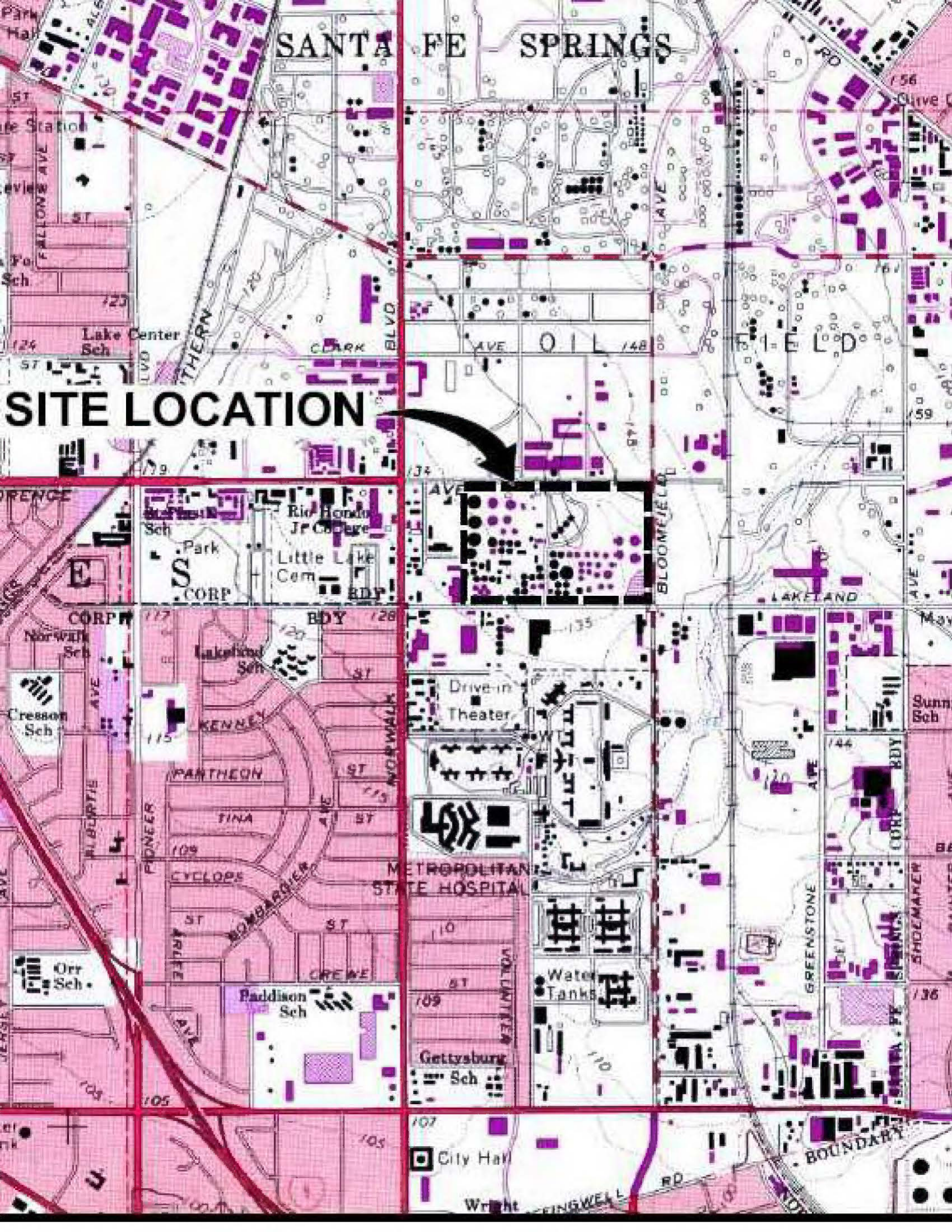
Oxygenates
MMT and Organic Lead Speciation
44 Results

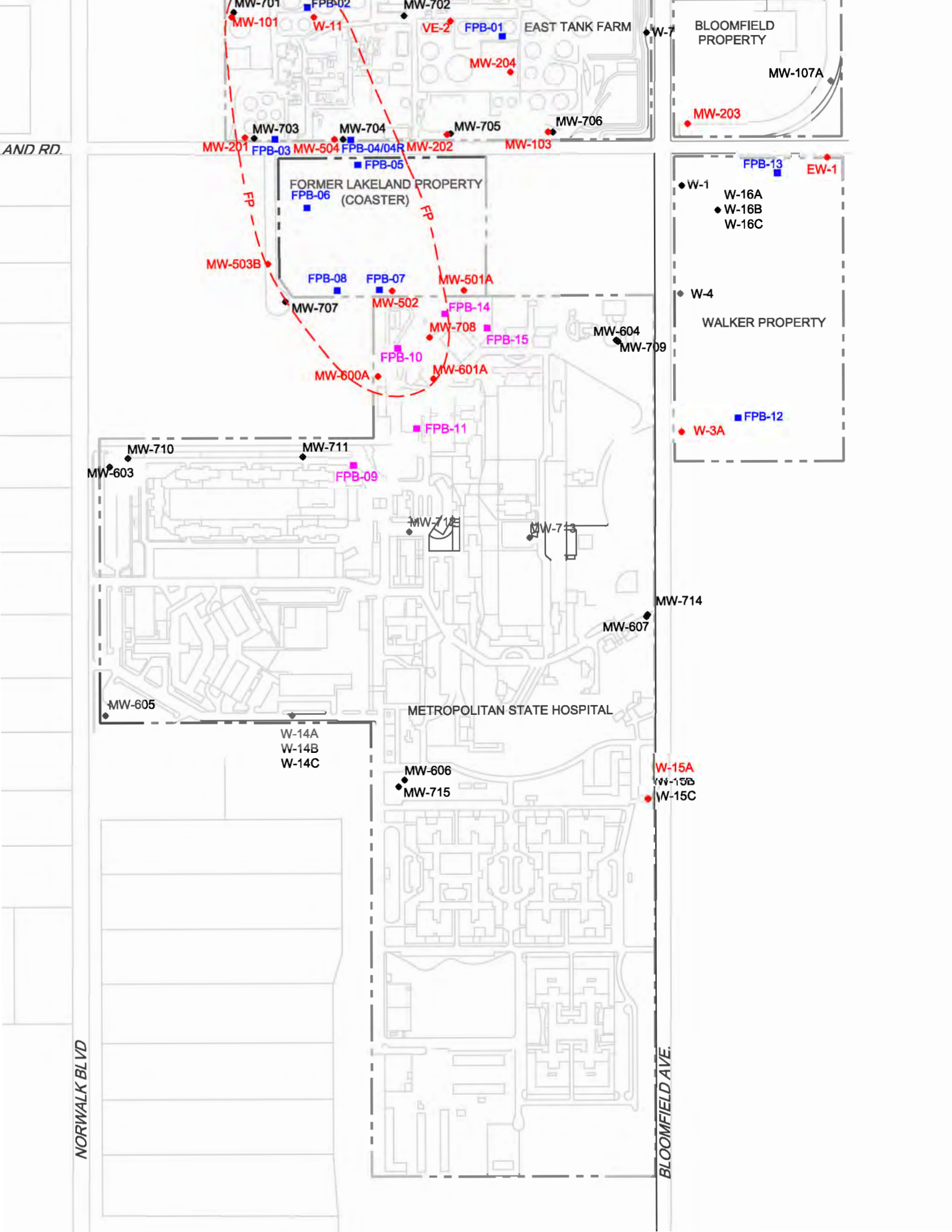
Table III
Summary of Groundwater Oxygenate Analytical Data
Former CENCO Refinery
Santa Fe Springs, CA

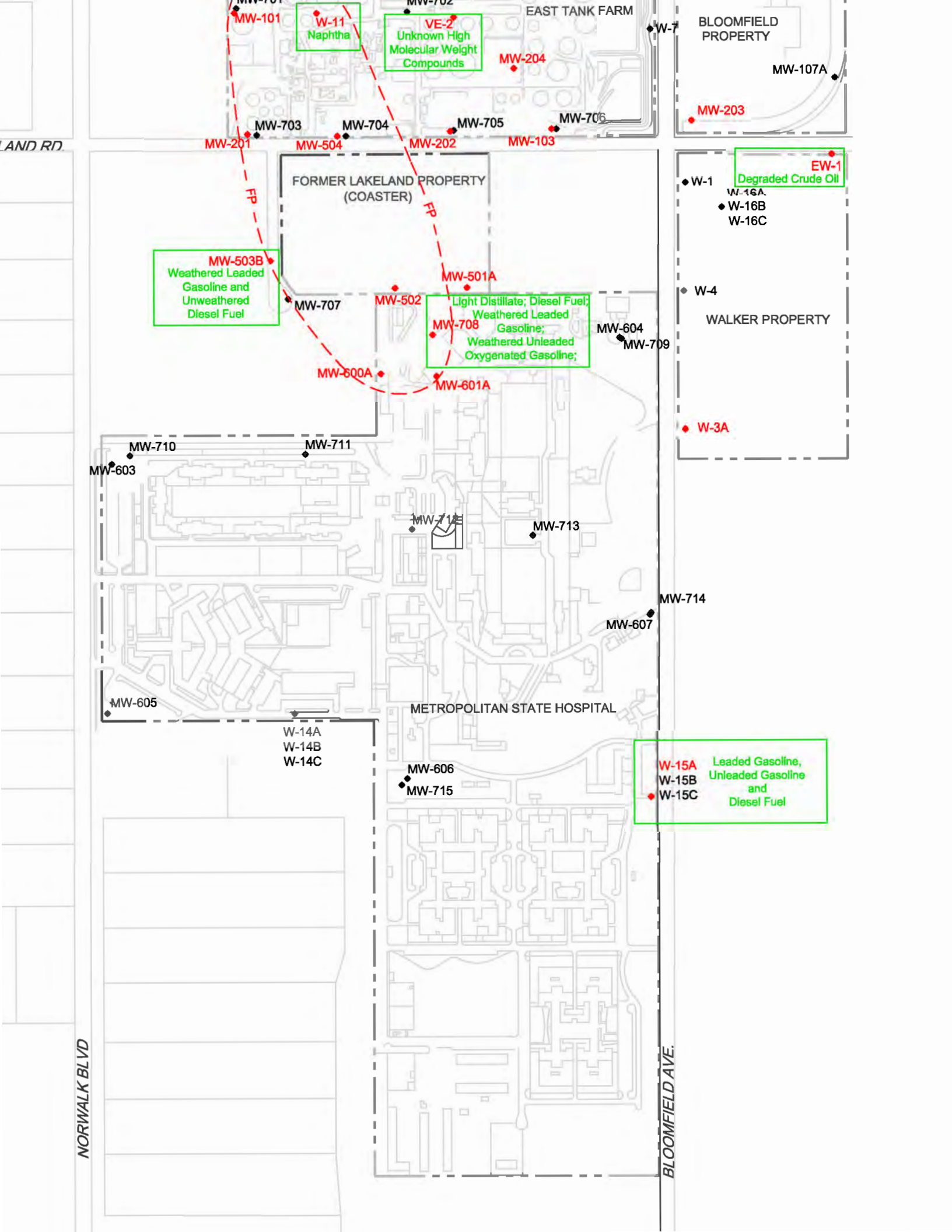
Location ID	Date Collected	MTBE	TBA	DIPE	ETBE
		ug/L	ug/L	ug/L	ug/L
EW-1	21-Aug-98	<50			
EW-1	28-Jan-99	<50			
EW-1	19-Jul-99	<25			
EW-1	13-Jan-00	NS			
EW-1	31-Jul-00	NS			
EW-1	06-Feb-01	NS			
EW-1	26-Jul-01	NS			
EW-1	06-May-02	NS	NS		
EW-1	25-Sep-02	NS	NS		
EW-1	10-Nov-06	<10	<100	<10	<10
EW-1	09-Feb-07	<5	<50	<5	<5
EW-1	10-May-07	<10	17	<10	<10
EW-1	10-Aug-07	<5	15	<5	<5
EW-1	08-Feb-08	<10	31	<10	<10
EW-1	03-Feb-11	<1.0	<10	<2.0	<2.0
EW-1	03-Feb-11	<1.0	<10	<2.0	<2.0
EW-1	13-Apr-11	<1.0	<10	<2.0	<2.0
W-11	09-Nov-06	<5	<50	<5	<5
W-11	09-Nov-06	<5	<50	<5	<5
W-11	09-Feb-07	<10	<100	<10	<10
W-11	09-May-07	<5	<50	<5	<5
W-11	08-Aug-07	<5	<50	<5	<5
W-11	08-Nov-07	<0.32	<4.9	<0.25	<0.28
W-11	08-Dec-10	17	43	<2.0	<2.0
W-11	04-Feb-11	<1.0	<10	<2.0	<2.0
W-11	15-Apr-11	<1.0	<10	<2.0	<2.0
W-11	29-Aug-11	<1.0	<10	<2.0	<2.0
W-11	14-Nov-11	<1.0	<10	<2.0	<2.0
W-15A	11-Feb-08	650	120	<50	<50
W-15A	14-Jan-09	190	170	<5	<5
W-15A	24-Apr-09	220	220	<10	<10
W-15A	02-Mar-10	44	94	<2.0	<2.0
W-15A	10-May-10	85	<10	<2.0	<2.0
W-15A	02-Aug-10	71	180	<2.0	<2.0
W-15A	01-Nov-10	6.8	88	<2.0	<2.0
W-15A	01-Nov-10	2.5	98	<2.0	<2.0
W-15A	01-Feb-11	260	390	<2.0	<2.0
W-15A	05-Apr-11	450	<10	<2.0	<2.0
MW-503B	14-Jan-00	<20			
MW-503B	04-Aug-00	<10			
MW-503B	06-Feb-01	<20			
MW-503B	25-Jul-01	<50			

Table III
Summary of Groundwater Oxygenate Analytical Data
Former CENCO Refinery
Santa Fe Springs, CA

Location ID	Date Collected	MTBE	TBA	DIPE	ETBE
		ug/L	ug/L	ug/L	ug/L
MW-503B	09-May-02	<2	<20000		
MW-503B	26-Sep-02	<1	<10000		
MW-503B	01-Jul-04	<5	<100		
MW-503B	05-Oct-05	<20	<200	<40	<40
MW-503B	14-Feb-06	<10	<100	<10	<10
MW-503B	04-Aug-06	7.6	<50	<5	<5
MW-503B	10-Nov-06	<10	<100	<10	<10
MW-503B	09-Feb-07	<5	<50	<5	<5
MW-503B	11-May-07	1.3	<50	<5	<5
MW-503B	10-Aug-07	<5	<50	<5	<5
MW-503B	08-Nov-07	2.8	<20	<1	<1.1
MW-503B	11-Feb-08	3.4	<200	<20	<20
MW-503B	21-Jan-09	<25	<250	<25	<25
MW-503B	27-Apr-09	2.2	<50	<5	<5
MW-503B	08-Mar-10	2.9	<10	<2.0	<2.0
MW-503B	17-May-10	5.1	<10	<2.0	<2.0
MW-503B	09-Aug-10	<1.0	<10	<2.0	<2.0
MW-503B	08-Nov-10	9.6	<10	<2.0	<2.0
MW-503B	08-Nov-10	8.2	<10	<2.0	<2.0
MW-503B	04-Feb-11	<1.0	<10	<2.0	<2.0
MW-503B	15-Apr-11	9.1	63	<2.0	<2.0
MW-503B	15-Apr-11	9.0	64	<2.0	<2.0
MW-503B	29-Aug-11	4.4	<10	<2.0	<2.0
MW-503B	16-Nov-11	<1.0	<10	<2.0	<2.0
MW-708	04-Feb-11	330	<10	<2.0	<2.0
MW-708	01-Sep-11	2300	2500	<2.0	<2.0
MW-708	18-Nov-11	1000	<100	<20	<20


SANTA FE SPRINGS
SITE LOCATION
OIL FIELD
Lake Center Sch
Rio Hondo Jr College
Park
Little Lake Cem
Norwalk Sch
Lakeland Sch
Drive-in Theater
Cresson Sch
Orr Sch
Paddison Sch
Gettysburg Sch
Water Tanks
City Hall
METROPOLITAN STATE HOSPITAL
PIONEER BLVD
NORWALK BLVD
BLOOMFIELD AVE
LAKELAND AVE
GREENSTONE AVE
KENNEY ST
PARTHENON ST
TINA ST
CYCLOPS ST
BOMBARDIER ST
CREWE ST
VOLUNTEER ST
SHOEMAKER AVE
BOUNDARY RD
Wright FINGWELL RD


MW-701
FPB-02
MW-702
MW-101
W-11
VE-2
FPB-01
EAST TANK FARM
W-7
BLOOMFIELD PROPERTY
MW-204
MW-107A
MW-203
MW-703
MW-704
MW-705
MW-706
MW-201
FPB-03
MW-504
FPB-04/04R
MW-202
MW-103
FPB-05
FORMER LAKELAND PROPERTY
FPB-06
(COASTER)
FP
FP
FPB-13
EW-1
W-1
W-16A
W-16B
W-16C
MW-503B
FPB-08
FPB-07
MW-501A
MW-707
MW-502
FPB-14
MW-708
FPB-15
MW-604
MW-709
FPB-10
MW-600A
MW-601A
W-4
WALKER PROPERTY
FPB-11
FPB-12
W-3A
MW-710
MW-711
MW-603
FPB-09
MW-712
MW-713
MW-714
MW-607
MW-605
METROPOLITAN STATE HOSPITAL
W-14A
W-14B
W-14C
MW-606
MW-715
W-15A
W-15B
W-15C
AND RD.
NORWALK BLVD
BLOOMFIELD AVE.


EAST TANK FARM
BLOOMFIELD PROPERTY
MW-101
W-11
Naphtha
VE-2
Unknown High Molecular Weight Compounds
MW-204
W-7
MW-107A
MW-203
MW-703
MW-704
MW-705
MW-706
MW-201
MW-504
MW-202
MW-103
FORMER LAKELAND PROPERTY (COASTER)
FP
FP
EW-1
Degraded Crude Oil
W-1
W-16A
W-16B
W-16C
MW-503B
Weathered Leaded Gasoline and Unweathered Diesel Fuel
MW-501A
MW-502
MW-707
Light Distillate; Diesel Fuel; Weathered Leaded Gasoline; Weathered Unleaded Oxygenated Gasoline;
MW-708
MW-604
MW-709
W-4
WALKER PROPERTY
MW-600A
MW-601A
W-3A
MW-710
MW-711
MW-603
MW-712
MW-713
MW-714
MW-607
MW-605
METROPOLITAN STATE HOSPITAL
W-14A
W-14B
W-14C
MW-606
MW-715
W-15A
W-15B
W-15C
Leaded Gasoline, Unleaded Gasoline and Diesel Fuel
NORWALK BLVD
BLOOMFIELD AVE.

Appendix A

California Regional Water Quality Control Board
Los Angeles Region

320 W. 4th Street, Suite 200, Los Angeles, California 90013
Phone (213) 576-6600 FAX (213) 576-6640 - Internet Address: http://www.waterboards.ca.gov/losangeles

Linda S. Adams
Cal/EPA Secretary

Arnold Schwarzenegger
Governor

July 21, 2010

Mr. Mike Barranco
Lakeland Development Company
12345 Lakeland Road
Santa Fe Springs, California 90670

REQUIREMENTS FOR SUBSURFACE INVESTIGATION AND CLEANUP PURSUANT TO CLEANUP AND ABATEMENT ORDER NO. 97-118, FORMER POWERINE / CENCO REFINERY, 12345 LAKELAND ROAD, SANTA FE SPRINGS, CALIFORNIA, (SCP NO. 0318A, SITE ID NO. 2040071)

Mr. Barranco:

The California Regional Water Quality Control Board, Los Angeles Region (Regional Board) is the state regulatory agency responsible for protecting water quality in Los Angeles and Ventura Counties, including the above-referenced site (Site). To accomplish this, the Regional Board issues investigative orders, cleanup and abatement orders, waste discharge requirement permits, tank cleanup orders, and other directives authorized by the Porter- Cologne Water Quality Control Act or the California Health and Safety Code.

You are subject to Cleanup and Abatement Order (CAO) No. 97-118 issued to Powerine Oil Company (Powerine) on August 25, 1997, pursuant to California Water Code section 13304. CAO 97-118 ordered Powerine, as the responsible party, to investigate, cleanup and abate soil contamination and groundwater pollution at, and groundwater pollution emanating from, the subject facility at 12345 Lakeland Road in Santa Fe Springs, California. The requirements of CAO 97-118 apply to Lakeland Development Company as the successor to Powerine. The Department of Toxic Substances Control (DTSC) is coordinating with Regional Board staff to review site documents and thereby ensure that risks to human health are addressed by your investigations.

The Regional Board has received the *Second Quarter Groundwater Monitoring Report*, dated June 25, 2010 and submitted by your consultant, Murex Environmental. A large number of wells sampled in the monitoring program no longer have groundwater and hydrocarbon impacts cannot be determined. We have thus determined that additional work is necessary to maintain groundwater monitoring capability in groundwater beneath, and extending down-gradient from, the Site. You shall submit a workplan for complete delineation of the hydrocarbon impacts to groundwater originating from the Site. The groundwater workplan shall include north-to-south and east-to-west cross sections depicting hydrostratigraphic units beneath the Site interpreted from borehole logs, existing and proposed groundwater monitoring wells with depth and perforation intervals, and historical and current groundwater levels. Submit this Groundwater Monitoring Workplan to the Regional Board and the DTSC by **September 3, 2010.**

The Regional Board received the *Revised Off-Site Soil Gas Survey Workplan*, dated August 14, 2007, approved it in a letter dated January 11, 2008, and extended the due date to August 29, 2008 in a June 20, 2008 letter. Regional Board staff understand the execution of the workplan has been prevented due to property access and financial issues, which have since been resolved. You shall submit a revised soil gas

survey workplan that incorporates delineation of elevated volatile organic compound (VOCs) concentrations in soil gas, offsite to the south, beneath Lakeland Road and beyond as necessary. Propose sample locations to assess VOC concentrations in the soil gas in the Metropolitan State Hospital facility. Include a health and safety plan, and soil gas investigation quality assurance (QA)/ quality control (QC) protocol. Submit this Revised Off-Site Soil Gas Assessment Workplan to the Regional Board and DTSC by **September 3, 2010.**

The Regional Board received the *Free Phase Petroleum Hydrocarbon Investigation Work Plan, dated August 31, 2007*, approved it in a letter dated January 11, 2008, and extended the due date to August 29, 2008 in a June 20, 2008 letter. No technical report has been submitted and your ability to determine the extent and thickness of free-phase petroleum hydrocarbons is severely restricted by the falling groundwater levels noted above. You shall submit an update to the *Free Phase Petroleum Hydrocarbon Investigation Work Plan* including recent data and data gaps, and a proposed schedule for the completion of the work. Submit this Revised Free Phase Petroleum Hydrocarbon Investigation Workplan to the Regional Board and DTSC by **September 3, 2010.**

The Regional Board has received the *Supplemental Soil Investigation Report*, dated June 8, 2009. With this submission, sufficient information regarding site contaminants and characteristics has been accumulated to allow the evaluation of potential remedial technologies that could be included in a Remedial Action Plan. You shall submit a workplan to perform pilot and/or bench scale testing on considered remedial technologies for soil and groundwater. The purpose of the testing is to develop and confirm design parameters for remediation. The workplan must include the technologies, method of testing, and an implementation schedule. Furthermore, the testing plan must address the Site specific conditions and must be representative of the various soil and contaminant conditions at the Site. Submit this Pilot Testing Workplan to the Regional Board and DTSC by **September 17, 2010.**

The workplans are required under CAO No. 97-118. Pursuant to section 13308 of the California Water Code you are required to submit the above-referenced workplans by the due dates. Failure to submit the required technical reports/workplans by the specific due dates may result in civil liability administratively imposed by the Regional Board in an amount up to one thousand dollars ($1,000) for each day the technical reports/workplans are not received.

Please note that effective immediately, the Regional Board requires you to include a perjury statement in all work plans and reports submitted under 13267 orders and CAOs. The perjury statement shall be signed by a senior authorized representative of Lakeland Development Company (and not by a consultant). The statement shall be in the following format:

> "I [NAME], do herby declare under penalty of perjury under the laws of California, that I am [JOB TITLE] for [Subject Site], that I am authorized to attest to the veracity of the information contained in the reports described herein, and that the information contained [NAME AND DATE OF REPORT] is true and correct, and that this declaration was executed at [PLACE], [STATE], on [DATE]."

The State Water Resources Control Board (State Water Board) adopted regulations requiring the electronic submittals of information over the Internet using the State Water Board GeoTracker database.

You are required not only to submit hard copy reports required in this Order but also to comply by uploading all reports and correspondence prepared to date and additional required data formats to the GeoTracker system. Information about GeoTracker submittals, including links to text of the governing regulations, can be found on the Internet at the following link:

http://www.waterboards.ca.gov/water_issues/programs/ust/electronic_submittal

As presented in State Water Resources Control Board Resolution 92-49, professionals should be qualified, licensed where applicable, and competent and proficient in the fields pertinent to the required activities. Moreover, the final report submitted to this Regional Board must be reviewed, signed and stamped by a California registered geologist, or a California registered civil engineer with at least five years hydrogeologic experience. Furthermore, the California Business and Professions Code Sections 6735, 7835, and 7835.1 require that engineering and geologic evaluations and judgments be performed by or under the direction of a registered geologist or registered civil engineer. A statement is required in the final report that the registered professional in responsible charge actually supervised or personally conducted all the work associated with the work plan and final report.

If you have any questions regarding this project, please contact Don Indermill of my staff at (213) 576-6811 or dindermill@waterboards.ca.gov.

Sincerely,

Samuel Unger
Interim Executive Officer

cc: Steve Hariri, Department of Toxic Substances Control, Cypress, CA
Paris Hajali, Murex Environmental Inc., Tustin CA
David Isola, Isola & Ruiz, LLP, Lodi, CA

California Regional Water Quality Control Board
Los Angeles Region

320 West Fourth Street, Suite 200, Los Angeles, California 90013
(213) 576-6600 • Fax (213) 576-6640
http://www.waterboards.ca.gov/losangeles

Linda S. Adams
Acting Secretary for
Environmental Protection

Edmund G. Brown Jr.
Governor

February 15, 2011

Mr. Mike Barranco
Lakeland Development Company
12345 Lakeland Road
Santa Fe Springs, California 90670

SUBJECT: **APPROVAL OF WORK PLAN FOR FREE PHASE PETROLEUM HYDROCARBON INVESTIGATION ADDENDUM, PURSUANT TO CALIFORNIA WATER CODE SECTION 13304 CLEANUP AND ABATEMENT ORDER NO. 97-118**

SITE: **FORMER POWERINE / CENCO REFINERY, 12345 LAKELAND ROAD, SANTA FE SPRINGS, CALIFORNIA, (SCP NO. 0318A, SITE ID NO. 2040071)**

Dear Mr. Barranco:

Regional Board staff have received and reviewed the *Free Phase Petroleum Hydrocarbon* (FPPH) *Investigation Status Report*, dated September 3, 2010, prepared and submitted on your behalf by Murex Environmental. The Status Report includes an Addendum to an FPPH Work Plan previously approved by the Regional Board on January 11, 2008.. The original Work Plan was submitted in response to the Regional Board's April 3, 2007 directive letter pursuant to California Water Code (CWC) section 13304 Cleanup and Abatement Order No. 91-118.

An oil refinery was operated at the Site from the 1930's until 1995 and the surrounding properties are currently used for commercial and industrial purposes. The refinery operations resulted in impact to the subsurface; primarily with petroleum hydrocarbons.

The Work Plan Addendum proposes to reposition FPB-09, perform a bail down test of FPPH recharge, and perform continuous coring during well replacement installations to be proposed in the near future. The FPPH Work Plan Addendum is approved as proposed. The Regional Board understands that the soil coring will also be described in the well replacement work plan that will be submitted shortly.

Pursuant to section 13304 of the CWC and Order No. 97-118, you are required to submit a technical report, including the FPPH Investigation results, to the Regional Board by **June 30, 2011**, for our review and approval. The new due date to submit the above technical report is an amendment to the existing CWC section 13304 Cleanup and Abatement Order No. 91-118.

The Regional Board requires you to include a perjury statement in all work plans and reports submitted under Cleanup and Abatement Orders. The perjury statement shall be signed by a senior authorized representative at your company (and not by a consultant). The statement shall be in the following format:

"I [NAME], do hereby declare, under penalty of perjury under the laws of the State of California, that I am [JOB TITLE] for [NAME OF RESPONSIBLE PARTY\DISCHARGER], that I am authorized to attest to the veracity of the information contained in the report(s) described herein, and that the information contained in [NAME AND DATE OF REPORT] is true and correct, and that this declaration was executed at [PLACE], [STATE], on [DATE]."

Pursuant to section 13350 of the CWC, failure to submit the required technical report by **June 30, 2011**, or failure to comply with provisions of Cleanup and Abatement Order No. 97-118, may result in civil liability penalties administratively imposed by the Regional Board in an amount up to five thousand dollars ($5,000) for each day the technical report is not received and without further warning.

Should you have any questions related to this project, please telephone Don Indermill, of my staff, at (213) 576-6811, or email him at dindermill@waterboards.ca.gov.

Sincerely,

for

Samuel Unger, P.E.
Executive Officer

cc: Jeremy Squire, Murex Environmental
Jeff Hawkins, Isola Law Group

From: Jeremy Squire [mailto:jeremysquire@murexenv.com]
Sent: Tuesday, August 30, 2011 12:52 PM
To: 'Don Indermill'
Cc: 'Mike Barranco'; 'Dave Isola'; 'Paris Hajali'; 'Jeff Hawkins'
Subject: Free Product Discovery - Santa Fe Springs, CA

Mr. Indermill –

This email is to notify the Board of the discovery of free-phase petroleum hydrocarbon (FPPH) product Murex is currently conducting groundwater sampling activities for the 3rd quarter 2011 at the former CENCO/Powerine Refinery in Santa Fe Springs, CA. During this event, FPPH was discovered for the first time in well W-15A, which is the well furthest from the property in the southeast direction. The attached map is from the FPPH Investigation report, showing monitoring wells, ROST boring locations, and locations of historical FPPH detections.

On Friday, August 19, depth-to-water/product measurements were taken. The only measureable FPPH was observed in wells EW-1 (1.78 foot thickness – this well frequently exhibits FPPH) and MW-711 (0.31 foot thickness, first time detection). No FPPH was measured in W-15A that day.

On Thursday, August 25, field staff began purging well MW-15A. After a short period of time, FPPH appeared in the purge water. The amount of FPPH in the purge water increased until it was the only thing pouring out of the hose. At that point, the field staff stopped purging and measured the product. It was 1.5 feet thick.

Staff have since returned to the well throughout the sampling event to gauge the FPPH thickness in W-15A. It increased to 4.85 feet thick before settling back to 4.5 feet, which was today's measurement.

It is unlikely that this FPPH is from the former CENCO/Powerine site releases. We have discussed this finding with our client and have been authorized to perform an analysis of the FPPH to determine its characteristics, as well as those FPPH samples taken from closer to the site for comparative purposes. We will provide the Board with an updated set of findings in a letter report in approximately 30-60 days.

Please contact me if you have any questions.

Regards,

Jeremy R Squire, P.E. | Senior Engineer
Murex Environmental, Inc. | 2640 Walnut Ave, Unit F, Tustin, CA 92780
P: 714.508.0800 | F: 714.508.0880 | M: 714.604.5836
jeremysquire@murexenv.com | visit www.murexenv.com

Appendix B

Cenco Project

Report Prepared for:

Murex Environmental Inc.
2640 Walnut Avenue, Unit F
Tustin, CA

Report Prepared By:

Alan Jeffrey, PhD

ZymaX Forensics, 600 S. Andreasen Drive, Suite B, Escondido, CA 92029

26 October 2011

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CONCLUSIONS	11
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Introduction

Six product samples, identified as LL_FPPH_503B_020411_01, LL_FPPH_EW1_091411_01, LL_FPPH_W11_120810_01, LL_FPPH_VE2A_090711_01, LL_FPPH_MW708_040611_01, and LL_FPPH_W15A_091411_01 were received at Zymax on September 21, 2011 for identification of petroleum products in the samples. The following analyses were performed.

1. C_3-C_{44} whole oil analysis by GC/FID
2. 6 oxygenate blending agent by EPA 1625 mod
3. EDB/MMT/Organic lead speciation by GC/ECD

The complete laboratory data report is presented as an Appendix to this report.

Table 1. Hydrocarbon products and key marker compounds in the samples

Sample	Constituents		Iso-octane/ methylcyclohexane	Pristane/ Phytane
	Major	Minor		
LL_FPPH_503B_020411_01	Weathered leaded gasoline A	Relatively fresh diesel A	1.8	1.2
LL_FPPH_EW1_091411_01	Degraded naphtha + fuel oil or degraded crude oil		0	2.3
LL_FPPH_W11_120810_01	Naphtha		0	NA
LL_FPPH_VE2A_090711_01	Unknown high mol wt compounds	Kerosene	NA	NA
LL_FPPH_MW708_040611_01	Weathered leaded gasoline B light distillate relatively fresh diesel B		0.2	2.2
LL_FPPH_W15A_091411_01	Weathered leaded gasoline B	Relatively fresh diesel B	0.2	2.1

Methodology

C_3-C_{44} whole oil analysis of product samples by GC/FID (ASTM D3328)

Identifies up to 149 compounds in the range between gasoline and residual oil. Includes gasoline-range PIANO analysis. Assists in the identification of types of petroleum products or crude oils present.

Product samples are directly injected into a GC equipped with a 100 meter Petrolcol column to separate the hydrocarbon, which are detected with a flame ionization detector (FID) interfaced to the GC. Hydrocarbons in the range of C_3 to C_{44} are identified and the peak areas measured. The relative area percent of hydrocarbons in the range of C_3 to C_{10} are calculated and presented as a PIANO distribution (normalized amounts of paraffins, isoparaffins, aromatics, naphthenes, olefins).

6 oxygenate blending agents in product samples by EPA Method 1625 Modified

*Quantifies oxygenated additives **(MtBE, DIPE, EtBE, TAME, TBA, Ethanol)** in samples. Data can provide information on the age of unleaded gasoline.*

Product samples are frozen in a vial in liquid nitrogen. Distilled water is added to the vial, and the product allowed to warm to partition the fuel oxygenates into the water. Recovery is monitored by isotopic dilution of deuterated fuel oxygenates. Six fuel oxygenates (MTBE, ETBE, DIPE, TAME, TBA, and ethanol) are identified and quantified in the water by injection into a gas chromatograph (GC) equipped with a 30 meter narrow bore ZB Wax capillary column interfaced to a mass spectrometer (MS) in Selected Ion Monitoring (SIM) mode.

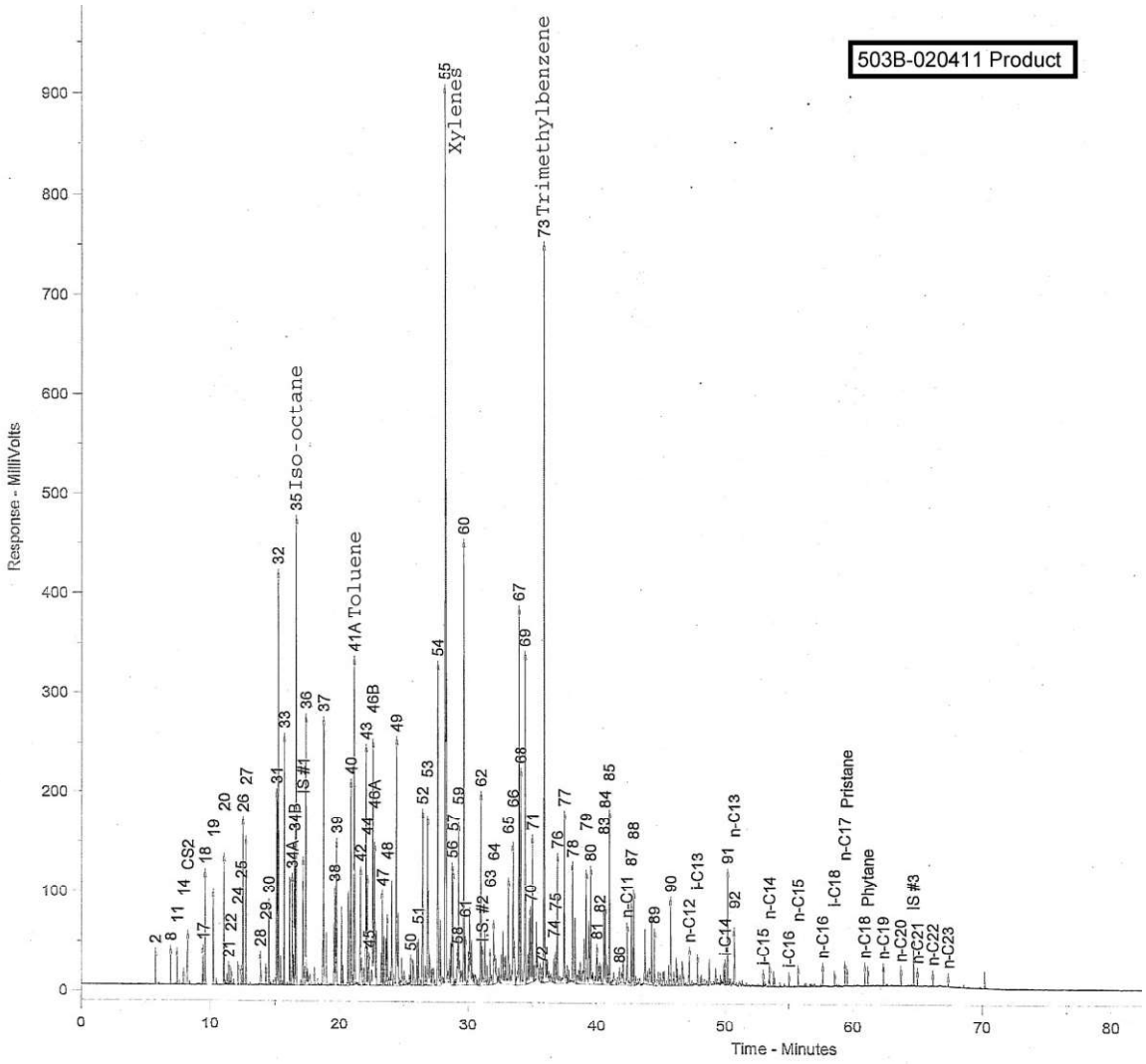
EDB, MMT, and alkyllead speciation in product samples by GC/ECD

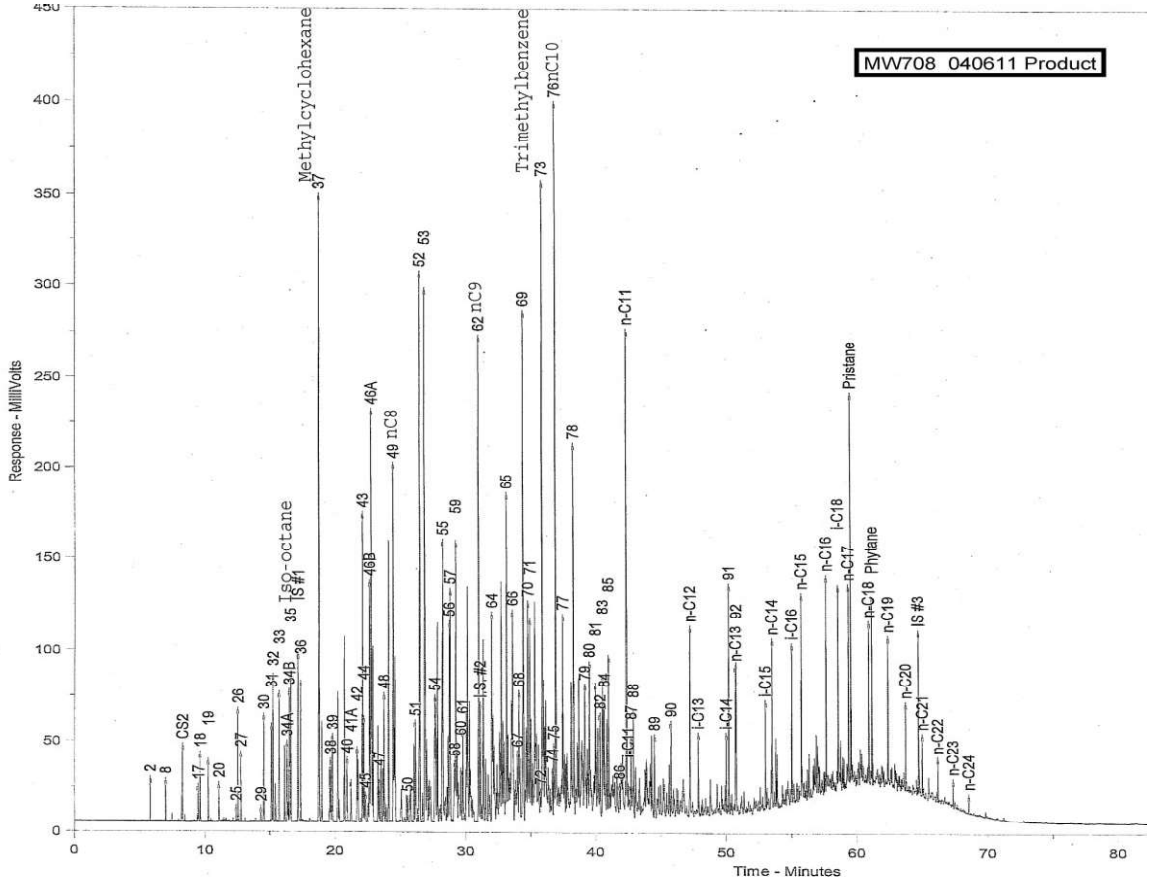
Quantifies the five alkyl lead compounds added to leaded gasoline as well as the lead scavenger, edb, and the manganese additive MMT. Provides information on age of leaded gasoline.

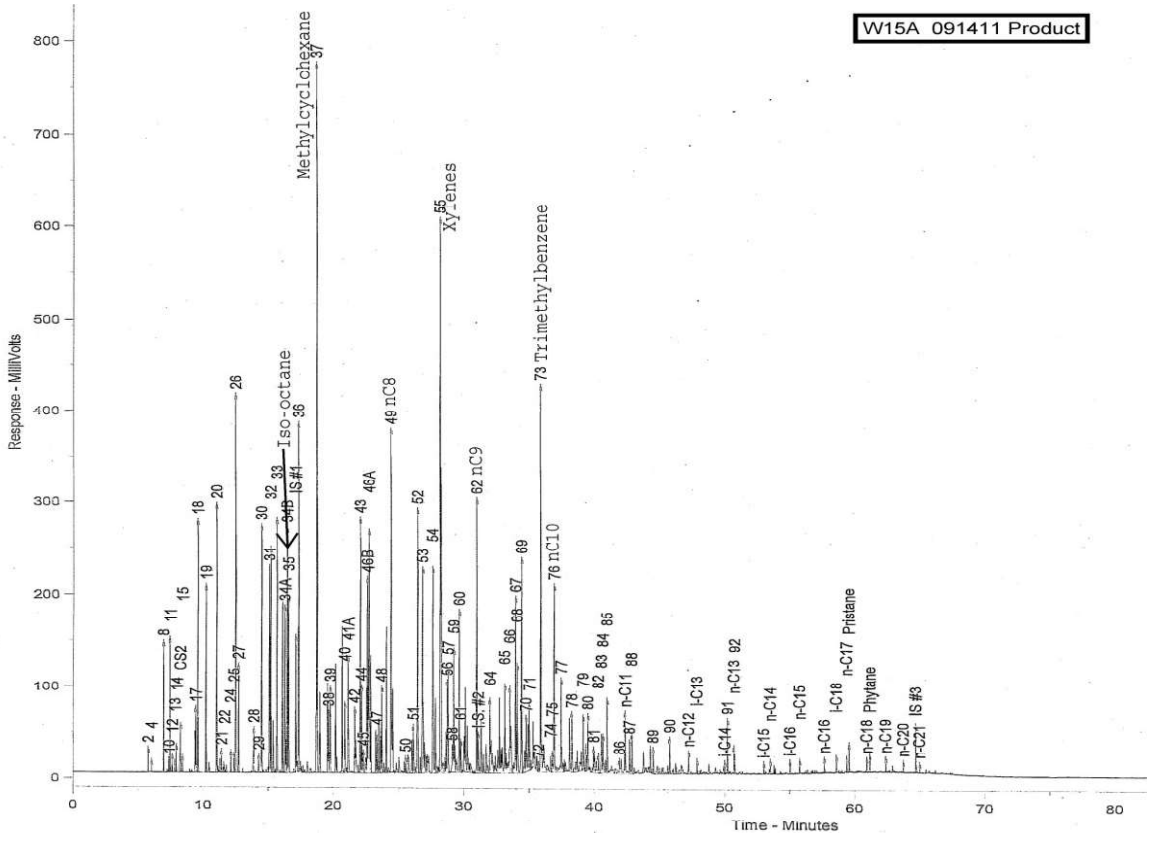
Product samples are directly injected into a GC equipped with a 60 meter DB1 column. Tetramethyllead, trimethylethyllead, dimethyldiethyllead, methyltriethyllead, tetraethyllead, methylcyclopentadienyl manganese tricarbonyl, and ethylene dibromide are detected with an electron capture detector (ECD) interfaced to the GC.

Product Identification and Characterization

The C_3-C_{44} whole oil chromatograms of samples 503B, MW708, and W15A, below and on the next page, show volatile hydrocarbons from 6 min to about 45 min retention time, and higher boiling hydrocarbons from about 45 min to about 70 min retention time. Complete compound identifications are provided in the data appendix.




MW708_040611 Product
Response - MilliVolts
Time - Minutes
Methylcyclohexane
Trimethylbenzene
Iso-octane
nC8
nC9
nC10
n-C11
Pristane
Phytane
n-C12
n-C13
n-C14
n-C15
n-C16
n-C17
n-C18
n-C19
n-C20
n-C21
n-C22
n-C23
n-C24
i-C13
i-C14
i-C15
i-C16
i-C18
IS #1
IS #2
IS #3
CS2


W15A_091411 Product
Response - MilliVolts
Time - Minutes
Methylcyclohexane
Xylenes
Trimethylbenzene
Iso-octane
nC8
nC9
nC10
Pristane
Phytane
n-C11
n-C12
n-C13
n-C14
n-C15
n-C16
n-C17
n-C18
n-C19
n-C20
n-C21
i-C13
i-C14
i-C15
i-C16
i-C18
IS #1
IS #2
IS #3
CS2

The volatile products in the three samples contain marker compounds of gasoline: 2,2,4-trimethylpentane (iso-octane), which was blended into gasoline as part of an alkylate refinery stream; and alkyl lead compounds, which were added to gasoline to increase octane levels. The gasoline in 503B is different from the gasoline in MW708 and W15A, as illustrated by the large difference in the iso-octane/methylcyclohexane ratio (Table 1); this ratio is controlled by the formulation of the gasoline, and different ratios indicate different types of gasoline or different mixtures of gasoline. The gasoline in MW708 and W15A has a similar, low iso-octane/methylcyclohexane ratio, and may indicate that the two samples contain the same or a very similar gasoline, although the gasoline in MW708 is more weathered. The alkyl lead formulations are similar in all three samples (Table 2), and are dominated by methyltriethyl lead. Several different mixtures of alkyl lead compounds were available historically (Gibbs, 1997); the similarity in the relative amounts of the alkyl lead compounds in 503B, MW708, and W15A suggests that the same mix of alkyl lead compounds was added to the leaded gasoline in the three samples. The alkyl lead concentrations, however, are significantly lower in 503B. Leaded gasoline was banned in California in 1992, and the alkyl lead formulation in these gasolines was introduced in 1960 (Gibbs, 1997). The lead concentrations in the gasoline in the three samples would have been most prevalent before about 1985. Fuel oxygenates, which were added to many unleaded gasolines, were not detected in any of the samples

Samples MW708 and W15A show differences in their distribution from 30 min to 45 min retention time. MW708 contains a suite of prominent hydrocarbons from nC9 to nC12 that is not present in W15A. This represents a light distillate, such as mineral spirits or Stoddard solvent, which appears to be relatively mildly weathered.

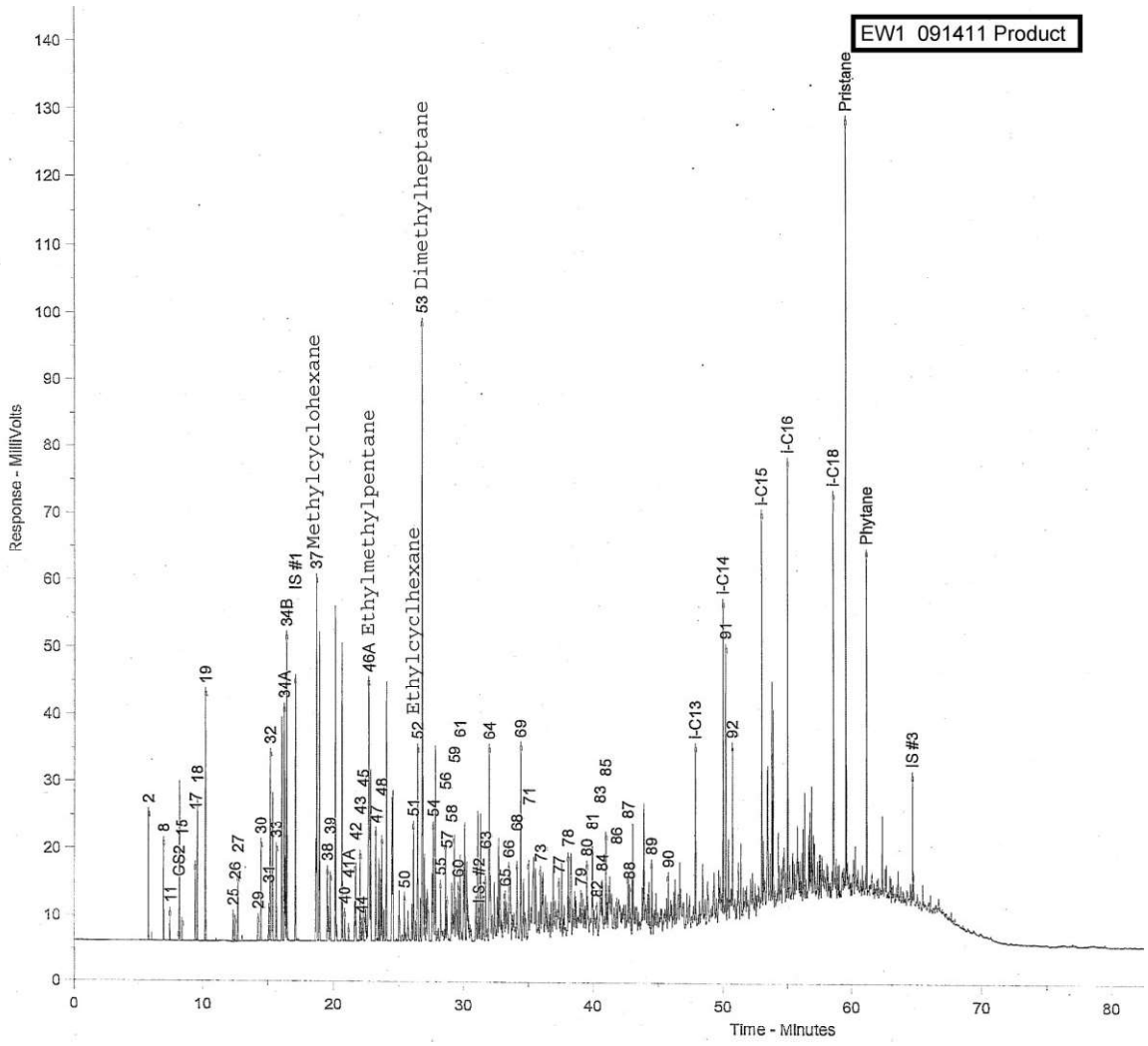
The higher boiling hydrocarbons in the three samples have a carbon range from about C12 to C23 and the distribution is consistent with a middle distillate such as #2 diesel or #2 fuel oil. The ratio of Pristane/Phytane, which is inherited by petroleum products such as middle distillates from the crude oil from which they are refined and is relatively unaltered in all but severely degraded samples, can be used to distinguish middle distillates refined from different crude oils (Stout et al, 2002, and refs. therein). As shown in Table 1, MW708 and W15A have a similar ratio that is significantly higher than the ratio in 503B. This suggests that the diesel/fuel oil in MW708 and W15A was refined from the same or a very similar crude oil, and is different from the diesel/fuel oil in 503B. All three diesel/fuel oils contain abundant n-alkanes, which are the most readily biodegraded hydrocarbons in petroleum products (Kaplan et al, 1997). Their abundance in these samples indicates that any degradation of the diesel/fuel oils has been relatively mild.

Table 2. **EDB and ORGANIC LEAD SPECIATION**

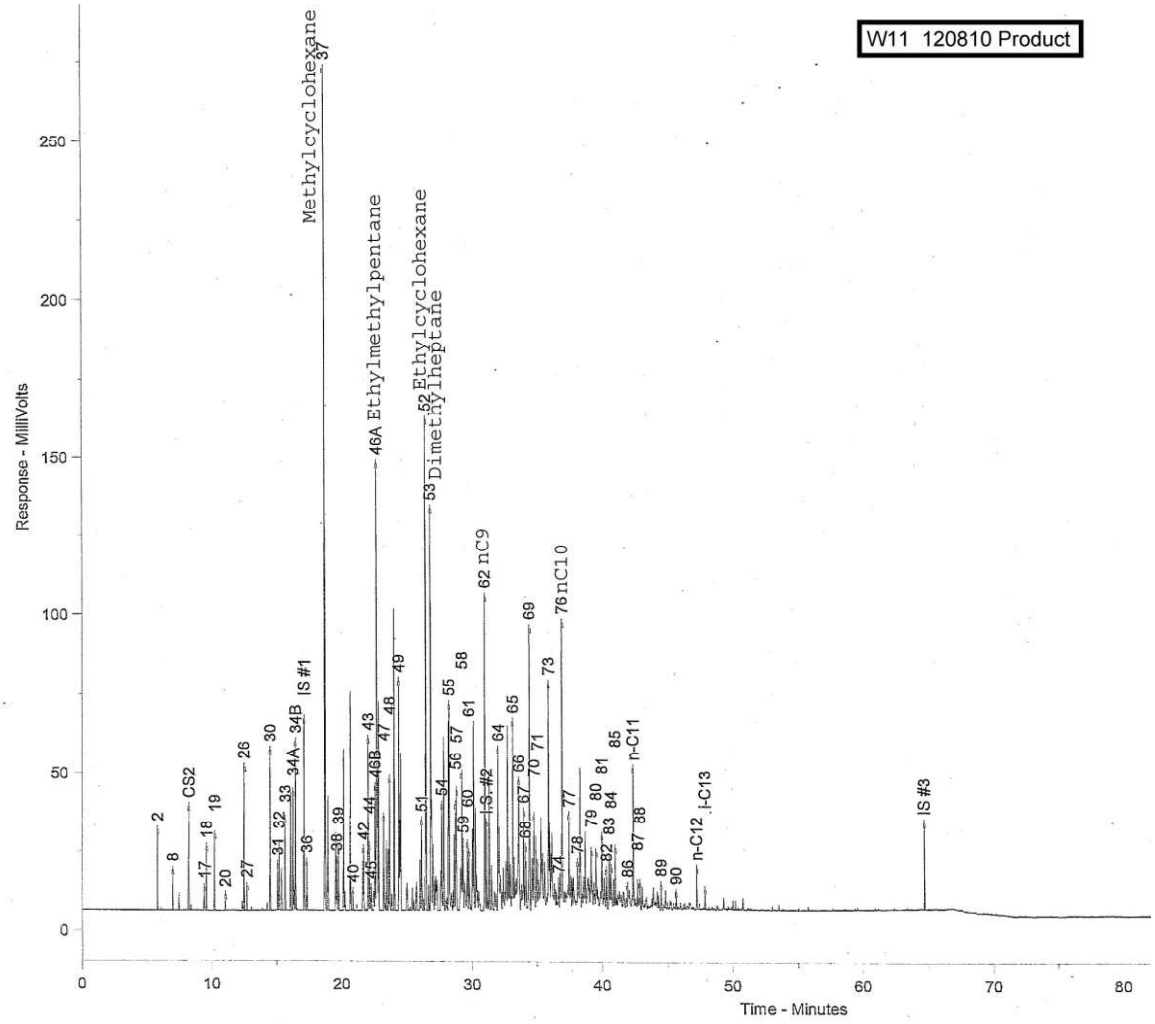
LAB NUMBER	SAMPLE DESCRIPTION	EDB mg/L	TML mg/L	TMEL mg/L	DMDEL mg/L	MTEL mg/L	TEL mg/L	MMT mg/L
42362-1	LL-FPHH-503B-020411-01	<0.5	<5	20.4	83.1	202.6	34.3	<5
42362-2	LL-FPHH-EW1-091411-01	<0.5	<5	<5	<5	<5	<5	<5
42362-3	LL-FPHH-W11-120810-01	<0.5	<5	<5	<5	<5	<5	<5
42362-4	LL-FPHH-VE2A-090711-01	<0.5	<5	<5	<5	<5	<5	<5
42362-5	LL-FPHH-MW708-040611-01	<0.5	<5	48.3	181.6	351.1	58.5	<5
42362-6	LL-FPHH-W15A-091411-01	<0.5	<5	43.6	215.9	496.8	106.7	<5
Detection Limit:		0.5	5.0	5.0	5.0	5.0	5.0	5.0
Method Blank:		<0.5	<5	<5	<5	<5	<5	<5

EDB: Ethylene Dibromide
TML: Tetramethyl Lead
TMEL: Trimethylethyl Lead
DMDEL: Dimethyldiethyl Lead
MTEL: Methyltriethyl Lead
TEL: Tetraethyl Lead
MMT: Methylcyclopentadienyl Manganese Tricarbonyl

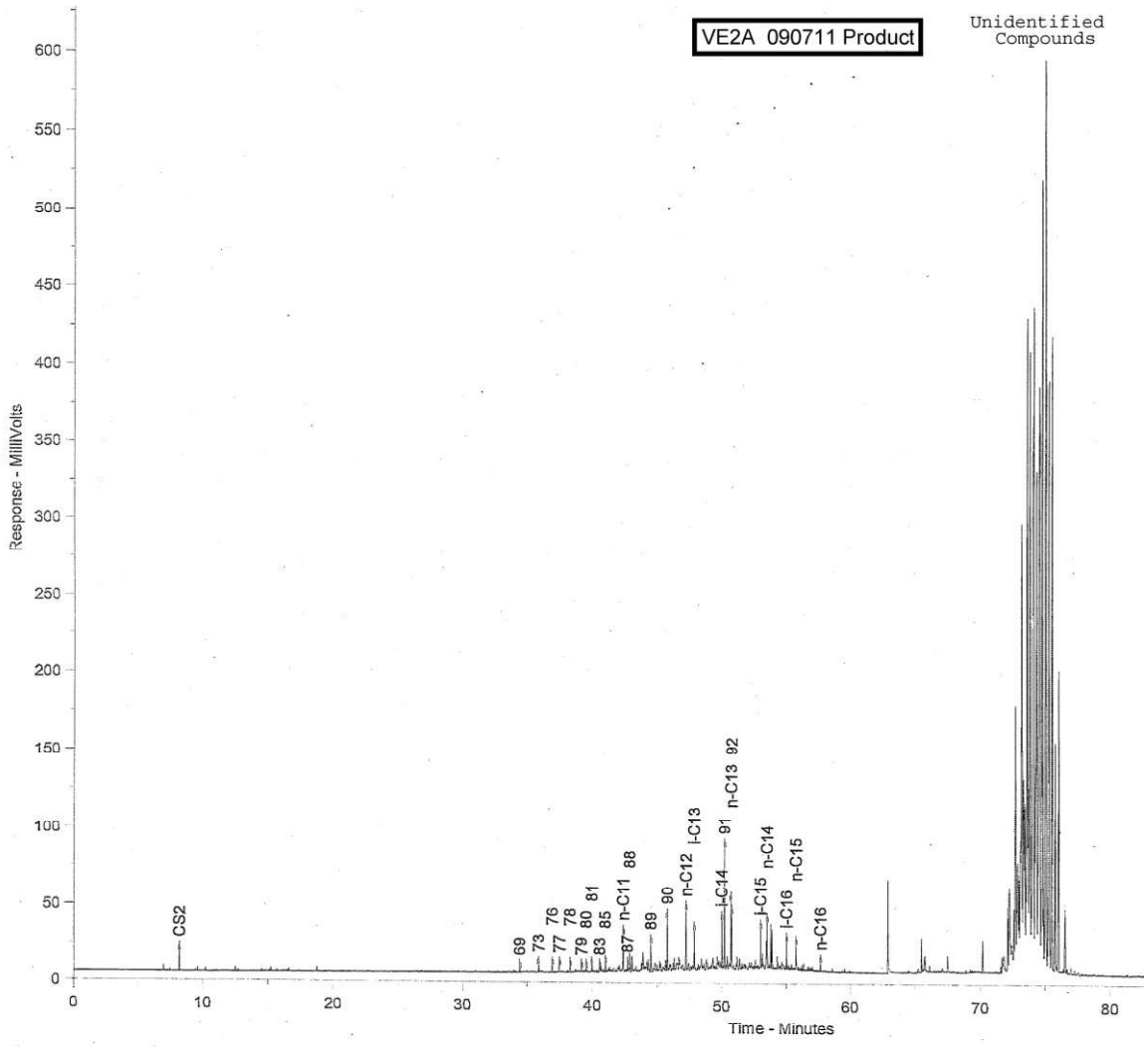
Sample EW1, shown below, also contains a mixture of volatile and heavier hydrocarbons. However, there is no evidence of gasoline in the sample: BTEX compounds were extremely low, and iso-octane and alkyl lead compounds were not detected. The volatile component could be a degraded naphtha. The heavier hydrocarbons could represent a middle distillate. However, the absence of n-alkanes indicates that the heavier product been degraded, and it also shows differences in the isoalkane pattern from the diesel/fuel oil in MW708. It is possible that the hydrocarbons in EW1 represent a single product, a degraded crude oil. The degree of weathering of the product or products in EW1 is not consistent with a recent release. A GC/MS analysis would help to better identify the composition of EW1.



Sample W11, shown below, contains a volatile product from C4 to C12. There was no evidence of gasoline in the sample: BTEX compounds were low, and iso-octane and alkyl lead compounds were not detected. The volatile distribution is consistent with naphtha. However, there is no similarity to the volatile hydrocarbons in EW1, which may also represent a naphtha.



Sample VE2A, shown below, has an unusual distribution for petroleum products. One component has a carbon range from about C10 to C16, and may represent a middle distillate such as kerosene. However the major component is represented by a suite of peaks from 72 to 76 min retention time, whose identity is unknown. A GC/MS analysis would be needed to identify these compounds.



Conclusions

Product samples LL_FPPH_503B_020411_01, LL_FPPH_EW1_091411_01, LL_FPPH_W11_120810_01, LL_FPPH_VE2A_090711_01, LL_FPPH_MW708_040611_01, and LL_FPPH_W15A_091411_01 contain at least eight different petroleum products as listed in Table1. These include the following products:

- Weathered leaded gasoline A in 503B.
- Weathered leaded gasoline B in MW708 and W15A containing similar alkyl lead formulations to 503B, but higher lead concentrations. MW708 is more weathered. The gasolines in 503B, MW708, and W15A were most likely produced between 1960 and 1985.
- Two types, A in 503B, B in MW708 and W15A, of relatively unweathered diesel or #2 fuel oil
- Naphtha in W11
- Light distillate such as mineral spirits or Stoddard solvent in MW708
- Degraded crude oil or a mixture of degraded naphtha and degraded fuel oil in EW1
- Unknown high molecular weight compounds dissolved in kerosene in VE2A

GC/MS analysis would be necessary to conclusively identify the product or products in EW1 and high molecular weight compounds in VE2A.

References

Gibbs, J.M. (1997) Gasoline Additives – When and Why *in* History of Aircraft Lubricants. Society of Automotive Engineers, SP-1272. pp. 125-145.

Kaplan, I.R., Galperin, Y., Lu, S., and Lee, R. (1997) Forensic Environmental Geochemistry: differentiation of fuel-types, their source and release time. *Organic Geochemistry*, 27, 289-317.

Stout, S.A, Uhler, A.D., McCarthy, K.J., and Emsbo-Mattingly, S. (2002) Chemical fingerprinting of hydrocarbons *in* Introduction to Environmental Forensics, Murphy, B.L. and Morrison eds. Academic Press, San Diego. pp.137-260.

CHAIN of CUSTODY

ZymaX
600 S Andreasen Dr. Ste. B
Escondido, California 92029
tel 760.781.3338
fax 760.781.3339

CLIENT EDD ☐ LUFT EDF ☐ DW EDT ☐

report to Jeremy Squire	tel (714) 508-0800	fax 714-508-0880
company Murex Environmental, Inc.	proj Cenco	
address 2640 Walnut Ave, Unit F Tustin, CA 92780	proj # 1003-001-300 sampler Frane Sosic	

Turnaround Time: ASAP ☐ 48hr ☐ 12hr ☐ 72hr ☐ 24hr ☐ std ☑

ZymaX use only	SAMPLE DESCRIPTION	Date Sampled	Time	Matrix	Preserve	C_3-C_{44} by GC/FID	Oxygenated Comp	EDB, MMT, Pb	# of containers	Remarks
42362-1	LL-FPPH-503B-020411-01	2-4-2011		FPPH	NP	X	X	X	2	1 VOA, 1 4-oz jar
-2	LL-FPPH-EW1-091411-01	9-14-2011	11:00	FPPH	NP	X	X	X	3	(2) VOA, (1) 4-oz jar
-3	LL-FPPH-W11-120810-01	12-8-2010	10:30	FPPH	NP	X	X	X	2	(2) VOAs
-4	LL-FPPH-VE2A-090711-01	9-7-2011	11:00	FPPH	NP	X	X	X	1	(1) 8-oz poly jar
-5	LL-FPPH-MW708-040611-01	4-6-2011	11:00	FPPH	NP	X	X	X	2	(1) 250 mL poly, (1) VOA
-6	LL-FPPH-W15A-091411-01	9-14-2011	11:30	FPPH	NP	X	X	X	3	(1) 4-oz jar, (2) VOA

Bill To: Same as Above ☐ OR
Company:
Address:

Relinquished by:
Signature: Frane Sosic
Print: Frank Sosic
Company: Murex Environmental
Date: 9.21.2011 Time: 1100

Received by:
Signature:
Print: Dan Marteski
Company: Sun Star Labs
Date: 9/21/11 Time: 1500

Sample integrity upon receipt:
- Samples received intact ☐
- Samples received cold ☐
- Custody seals ☐
- Correct container types ☐

PO#:
Quote yes ☐ no ☐

Relinquished by:
Signature:
Print: Dan Marteski
Company: Sun Star Labs
Date: 9/21/11 Time: 1100

Received by ZymaX:
Signature: Ryan Woon
Print: Ryan Woon
Company: Zymax
Date: 9/21/11 Time: 15:00

REPORT OF ANALYTICAL RESULTS

Client: Jeremy Squire Murex Environmental, Inc. 2640 Walnut Avenue, Unit F Tustin, CA. 92780	Lab Number: 42362 Collected: Received: 9/21/2011 Matrix: Product
Project: Cenco Project Number: 1003-001-300 Collected by: Frane Sosic	Sample Description: See Below Analyzed: 9/27/2011 Method: GC/ECD

EDB and ORGANIC LEAD SPECIATION

LAB NUMBER	SAMPLE DESCRIPTION	EDB mg/L	TML mg/L	TMEL mg/L	DMDEL mg/L	MTEL mg/L	TEL mg/L	MMT mg/L
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42362-2	LL-FPHH-EW1-091411-01	<0.5	<5	<5	<5	<5	<5	<5
42362-3	LL-FPHH-W11-120810-01	<0.5	<5	<5	<5	<5	<5	<5
42362-4	LL-FPHH-VE2A-090711-01	<0.5	<5	<5	<5	<5	<5	<5
42362-5	LL-FPHH-MW708-040611-01	<0.5	<5	48.3	181.6	351.1	58.5	<5
42362-6	LL-FPHH-W15A-091411-01	<0.5	<5	43.6	215.9	496.8	106.7	<5
Detection Limit:		0.5	5.0	5.0	5.0	5.0	5.0	5.0
Method Blank:		<0.5	<5	<5	<5	<5	<5	<5

EDB: Ethylene Dibromide
TML: Tetramethyl Lead
TMEL: Trimethylethyl Lead
DMDEL: Dimethyldiethyl Lead
MTEL: Methyltriethyl Lead
TEL: Tetraethyl Lead
MMT: Methylcyclopentadienyl Manganese Tricarbonyl

Submitted by,
Zymax Forensics, A DPRA Company

Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

42362e.xls
STL

QUALITY ASSURANCE REPORT

Client:	
Murex Environmental, Inc. 2640 Walnut Avenue, Unit F Tustin, CA. 92780	

Lab Number:	42362
Analyzed:	9/27/2011
Method:	GC/ECD

QA DATA FOR EDB and TEL

ANALYTES	RF	RF_D	%D	ACCEPTANCE LIMIT %
EDB	0.684	0.68	0.50	± 15
TEL	0.038	0.033	13.50	± 15

EDB: Ethylene Dibromide
TEL: Tetraethyl Lead
RF = Mean response factor from 3 point calibration
RF_D= Daily calibration standard response factor
% D = % Difference
Calibration file: ORG07168.M / MMT07168.M

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

42362e.xls
STL

REPORT OF ANALYTICAL RESULTS

ZymaX FORENSICS

Client: Jeremy Squire Murex Environmental, Inc. 2640 Walnut Avenue, Unit F Tustin, CA. 92780	Lab Number: 42362-1 Collected: 2/4/2011 Received: 9/21/2011 Matrix: Product
Project: Cenco Project Number: 1003-001-300 Collected by: Frane Sosic	Sample Description: LL-FPHH-503B-020411-01 Analyzed: 9/21/2011 Method: EPA 1624 GC/MS SIM

CONSTITUENT	PQL* mg/Kg	RESULT** mg/Kg
t-Amyl Methyl Ether (TAME)	100	ND
t-Butyl Alcohol (TBA)	10	ND
Diisopropyl Ether (DIPE)	100	ND
Ethanol	10	ND
Ethyl-t-Butyl Ether (ETBE)	50	ND
Methyl-t-Butyl Ether (MTBE)	50	ND
Percent Surrogate Recovery (MTBE-d3)		100

***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**
J:Below PQL

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director, Forensic Geochemistry

MSD #9
42362-1.OXY.xls
STL

REPORT OF ANALYTICAL RESULTS

ZymaX FORENSICS

Client: Jeremy Squire Murex Environmental, Inc. 2640 Walnut Avenue, Unit F Tustin, CA. 92780	Lab Number: 42362-2 Collected: 9/14/2011 Received: 9/21/2011 Matrix: Product
Project: Cenco Project Number: 1003-001-300 Collected by: Frane Sosic	Sample Description: LL-FPHH-EW1-091411-01 Analyzed: 9/21/2011 Method: EPA 1624 GC/MS SIM

CONSTITUENT	PQL* mg/Kg	RESULT** mg/Kg
t-Amyl Methyl Ether (TAME)	100	ND
t-Butyl Alcohol (TBA)	10	ND
Diisopropyl Ether (DIPE)	100	ND
Ethanol	10	ND
Ethyl-t-Butyl Ether (ETBE)	50	ND
Methyl-t-Butyl Ether (MTBE)	50	ND
Percent Surrogate Recovery (MTBE-d3)		97

*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.
J:Below PQL

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director, Forensic Geochemistry

MSD #9
42362-2.OXY.xls
STL

REPORT OF ANALYTICAL RESULTS

ZymaX FORENSICS

Client: Jeremy Squire Murex Environmental, Inc. 2640 Walnut Avenue, Unit F Tustin, CA. 92780	Lab Number: 42362-3 Collected: 12/8/2010 Received: 9/21/2011 Matrix: Product
Project: Cenco Project Number: 1003-001-300 Collected by: Frane Sosic	Sample Description: LL-FPHH-W11-120810-01 Analyzed: 9/21/2011 Method: EPA 1624 GC/MS SIM

CONSTITUENT	PQL* mg/Kg	RESULT** mg/Kg
t-Amyl Methyl Ether (TAME)	100	ND
t-Butyl Alcohol (TBA)	10	ND
Diisopropyl Ether (DIPE)	100	ND
Ethanol	10	ND
Ethyl-t-Butyl Ether (ETBE)	50	ND
Methyl-t-Butyl Ether (MTBE)	50	ND
Percent Surrogate Recovery (MTBE-d3)		95

*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.
J:Below PQL

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director, Forensic Geochemistry

MSD #9
42362-3.OXY.xls
STL

REPORT OF ANALYTICAL RESULTS

ZymaX FORENSICS

Client: Jeremy Squire Murex Environmental, Inc. 2640 Walnut Avenue, Unit F Tustin, CA. 92780	Lab Number: 42362-4 Collected: 9/7/2011 Received: 9/21/2011 Matrix: Product
Project: Cenco Project Number: 1003-001-300 Collected by: Frane Sosic	Sample Description: LL-FPHH-VE2A-090711-01 Analyzed: 9/21/2011 Method: EPA 1624 GC/MS SIM

CONSTITUENT	PQL* mg/Kg	RESULT** mg/Kg
t-Amyl Methyl Ether (TAME)	100	ND
t-Butyl Alcohol (TBA)	10	ND
Diisopropyl Ether (DIPE)	100	ND
Ethanol	10	ND
Ethyl-t-Butyl Ether (ETBE)	50	ND
Methyl-t-Butyl Ether (MTBE)	50	ND
Percent Surrogate Recovery (MTBE-d3)		106

***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**
J:Below PQL

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu

Shan-Tan Lu, Ph.D.
Director, Forensic Geochemistry

MSD #9
42362-4.OXY.xls
STL

REPORT OF ANALYTICAL RESULTS

ZymaX FORENSICS

Client: Jeremy Squire Murex Environmental, Inc. 2640 Walnut Avenue, Unit F Tustin, CA. 92780	Lab Number: 42362-5 Collected: 4/6/2011 Received: 9/21/2011 Matrix: Product
Project: Cenco Project Number: 1003-001-300 Collected by: Frane Sosic	Sample Description: LL-FPHH-MW708-040611-01 Analyzed: 9/21/2011 Method: EPA 1624 GC/MS SIM

CONSTITUENT	PQL* mg/Kg	RESULT** mg/Kg
t-Amyl Methyl Ether (TAME)	100	ND
t-Butyl Alcohol (TBA)	10	ND
Diisopropyl Ether (DIPE)	100	ND
Ethanol	10	ND
Ethyl-t-Butyl Ether (ETBE)	50	ND
Methyl-t-Butyl Ether (MTBE)	50	ND
Percent Surrogate Recovery (MTBE-d3)		102

*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.
J:Below PQL

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director, Forensic Geochemistry

MSD #9
42362-5.OXY.xls
STL

REPORT OF ANALYTICAL RESULTS

ZymaX FORENSICS

Client: Jeremy Squire Murex Environmental, Inc. 2640 Walnut Avenue, Unit F Tustin, CA. 92780	Lab Number: 42362-6 Collected: 9/14/2011 Received: 9/21/2011 Matrix: Product
Project: Cenco Project Number: 1003-001-300 Collected by: Frane Sosic	Sample Description: LL-FPHH-W15A-091411-01 Analyzed: 9/21/2011 Method: EPA 1624 GC/MS SIM

CONSTITUENT	PQL* mg/Kg	RESULT** mg/Kg
t-Amyl Methyl Ether (TAME)	100	ND
t-Butyl Alcohol (TBA)	10	ND
Diisopropyl Ether (DIPE)	100	ND
Ethanol	10	ND
Ethyl-t-Butyl Ether (ETBE)	50	ND
Methyl-t-Butyl Ether (MTBE)	50	27J
Percent Surrogate Recovery (MTBE-d3)		102

*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.
J:Below PQL

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director, Forensic Geochemistry

MSD #9
42362-6.OXY.xls
STL

C_3-C_{44} Whole Oil Analysis

1) Whole Chromatogram

2) Expanded Chromatogram (in 3 pages)

3) Quantitation Report with peak areas

Reviewed by: STL

ZymaX FORENSICS

9/22/2011

ZymaX ID	42362-1
Sample ID	LL-FPPH-503B-020411-01

Evaporation

n-Pentane / n-Heptane	0.06
2-Methylpentane / 2-Methylheptane	0.34

Waterwashing

Benzene / Cyclohexane	0.41
Toluene / Methylcyclohexane	1.60
Aromatics / Total Paraffins (n+iso+cyc)	1.08
Aromatics / Naphthenes	5.59

Biodegradation

(C4 - C8 Para + Isopara) / C4 - C8 Olefins	75.33
3-Methylhexane / n-Heptane	0.92
Methylcyclohexane / n-Heptane	1.04
Isoparaffins + Naphthenes / Paraffins	5.36

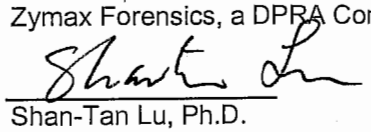
Octane rating

2,2,4,-Trimethylpentane / Methylcyclohexane	1.81

Relative percentages - Bulk hydrocarbon composition as PIANO

% Paraffinic	7.48
% Isoparaffinic	30.90
% Aromatic	51.38
% Naphthenic	9.19
% Olefinic	1.05

Submitted by,
Zymax Forensics, a DPRA Company



Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

ZymaX FORENSICS

9/22/2011

ZymaX ID	42362-1
Sample ID	LL-FPPH-503B-020411-01

		Relative Area %
1	Propane	0.00
2	Isobutane	0.11
3	Isobutene	0.00
4	Butane/Methanol	0.00
5	trans-2-Butene	0.00
6	cis-2-Butene	0.00
7	3-Methyl-1-butene	0.00
8	Isopentane	0.12
9	1-Pentene	0.00
10	2-Methyl-1-butene	0.00
11	Pentane	0.12
12	trans-2-Pentene	0.00
13	cis-2-Pentene/t-Butanol	0.00
14	2-Methyl-2-butene	0.03
15	2,2-Dimethylbutane	0.00
16	Cyclopentane	0.00
17	2,3-Dimethylbutane/MTBE	0.20
18	2-Methylpentane	0.63
19	3-Methylpentane	0.54
20	Hexane	0.78
21	trans-2-Hexene	0.09
22	3-Methylcyclopentene	0.08
23	3-Methyl-2-pentene	0.00
24	cis-2-Hexene	0.10
25	3-Methyl-trans-2-pentene	0.07
26	Methylcyclopentane	1.09
27	2,4-Dimethylpentane	1.00
28	Benzene	0.24
29	5-Methyl-1-hexene	0.10
30	Cyclohexane	0.58
31	2-Methylhexane/TAME	1.44
32	2,3-Dimethylpentane	3.07
33	3-Methylhexane	1.83
34A	1-trans-3-Dimethylcyclopentane	0.79
34B	1-cis-3-Dimethylcyclopentane	1.05
35	2,2,4-Trimethylpentane	3.74
I.S. #1	à,à,à-Trifluorotoluene	0.00

ZymaX FORENSICS

9/22/2011

ZymaX ID 42362-1
Sample ID LL-FPPH-503B-020411-01

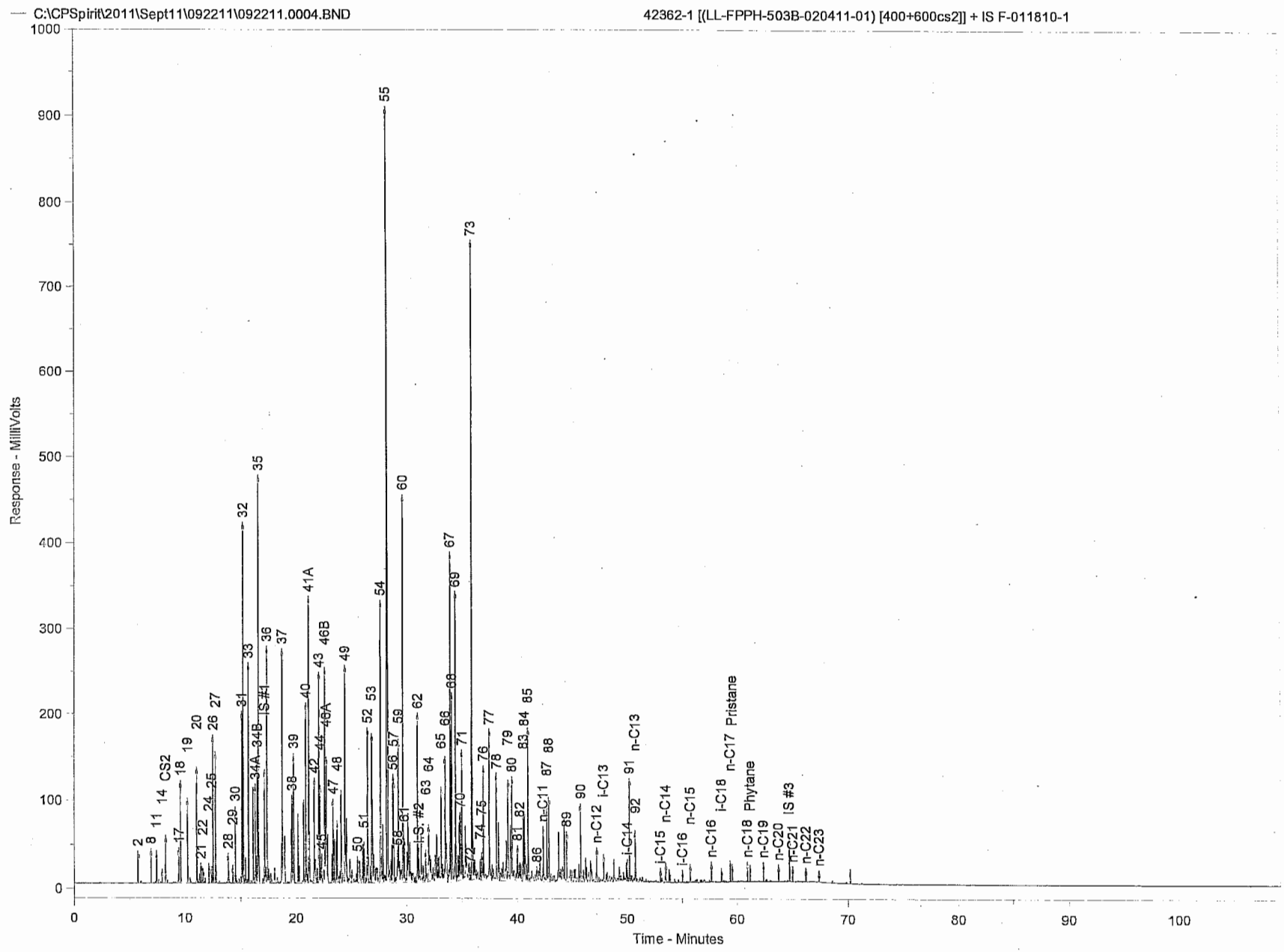
		Relative Area %
36	n-Heptane	1.98
37	Methylcyclohexane	2.07
38	2,5-Dimethylhexane	0.72
39	2,4-Dimethylhexane	1.22
40	2,3,4-Trimethylpentane	1.81
41	Toluene/2,3,3-Trimethylpentane	3.30
42	2,3-Dimethylhexane	0.97
43	2-Methylheptane	1.87
44	4-Methylheptane	0.80
45	3,4-Dimethylhexane	0.34
46A	3-Ethyl-3-methylpentane	1.47
46B	1,4-Dimethylcyclohexane	1.90
47	3-Methylheptane	0.74
48	2,2,5-Trimethylhexane	0.52
49	n-Octane	1.95
50	2,2-Dimethylheptane	0.17
51	2,4-Dimethylheptane	0.37
52	Ethylcyclohexane	1.72
53	2,6-Dimethylheptane	1.37
54	Ethylbenzene	3.09
55	m+p Xylenes	12.02
56	4-Methyloctane	0.94
57	2-Methyloctane	0.83
58	3-Ethylheptane	0.41
59	3-Methyloctane	1.30
60	o-Xylene	3.65
61	1-Nonene	0.42
62	n-Nonane	1.56
I.S.#2	p-Bromofluorobenzene	0.00
63	Isopropylbenzene	0.26
64	3,3,5-Trimethylheptane	0.53
65	2,4,5-Trimethylheptane	0.84
66	n-Propylbenzene	1.25
67	1-Methyl-3-ethylbenzene	3.09
68	1-Methyl-4-ethylbenzene	1.75
69	1,3,5-Trimethylbenzene	2.99
70	3,3,4-Trimethylheptane	0.96

ZymaX FORENSICS

9/22/2011

ZymaX ID	42362-1
Sample ID	LL-FPPH-503B-020411-01

		Relative Area %
71	1-Methyl-2-ethylbenzene	1.16
72	3-Methylnonane	0.06
73	1,2,4-Trimethylbenzene	6.57
74	Isobutylbenzene	0.18
75	sec-Butylbenzene	0.32
76	n-Decane	1.09
77	1,2,3-Trimethylbenzene	1.63
78	Indan	0.93
79	1,3-Diethylbenzene	1.05
80	1,4-Diethylbenzene	0.95
81	n-Butylbenzene	0.50
82	1,3-Dimethyl-5-ethylbenzene	0.13
83	1,4-Dimethyl-2-ethylbenzene	0.78
84	1,3-Dimethyl-4-ethylbenzene	0.79
85	1,2-Dimethyl-4-ethylbenzene	1.40
86	Undecene	0.15
87	1,2,4,5-Tetramethylbenzene	0.64
88	1,2,3,5-Tetramethylbenzene	0.76
89	1,2,3,4-Tetramethylbenzene	0.42
90	Naphthalene	0.66
91	2-Methyl-naphthalene	0.71
92	1-Methyl-naphthalene	0.17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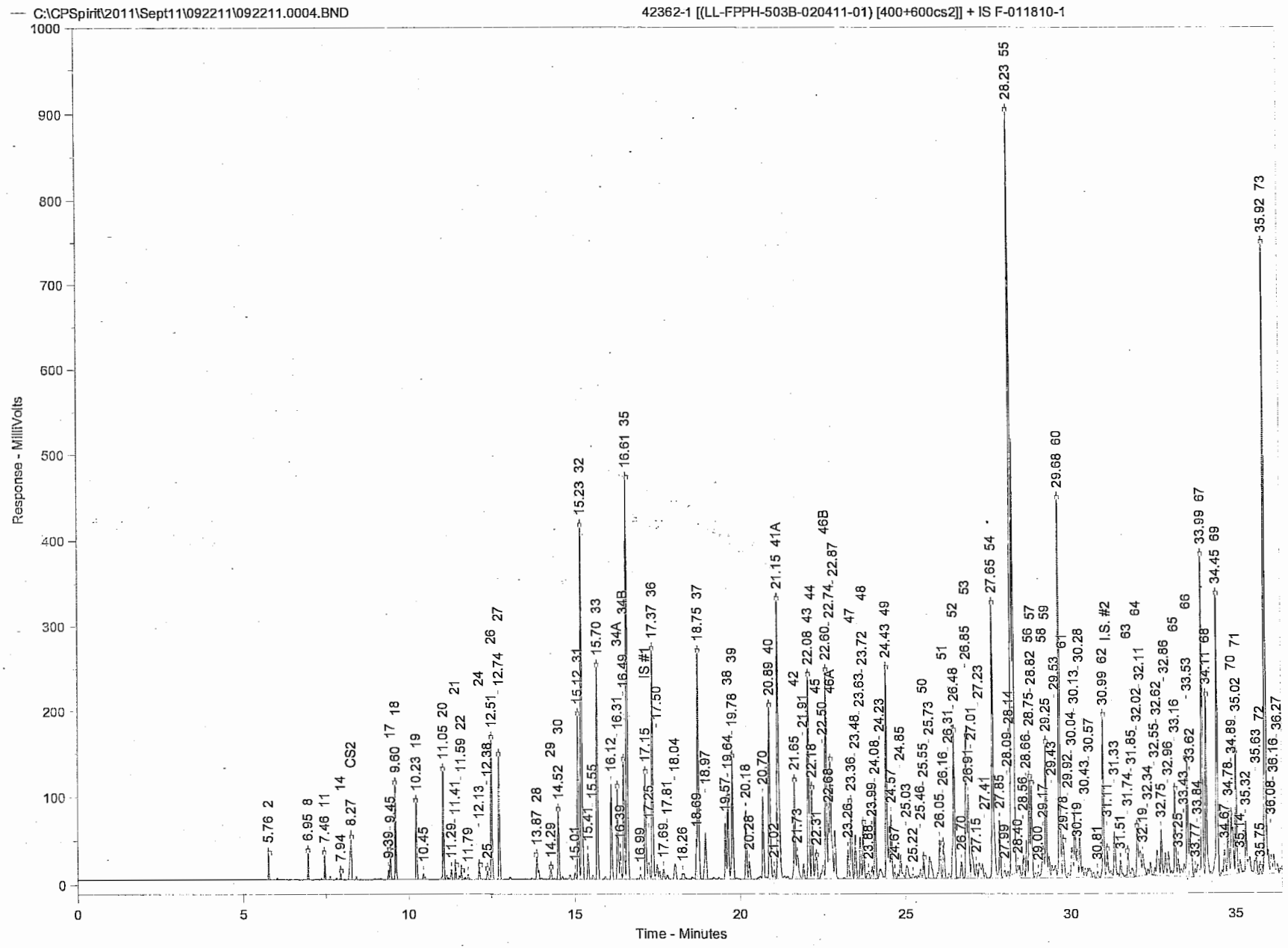
Response - MilliVolts
Time - Minutes
CS2
IS #1
IS #2
IS #3
Pristane
Phytane
n-C11
n-C12
n-C13
n-C14
n-C15
n-C16
n-C17
n-C18
n-C19
n-C20
n-C21
n-C22
n-C23
i-C13
i-C14
i-C15
i-C16
i-C18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42362-1 [(LL-FPPH-503B-020411-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
1000
900
800
700
600
500
400
300
200
100
0
0
5
10
15
20
25
30
35
5.76 2
6.95 8
7.46 11
7.94 14
8.27 CS2
9.39 9.45 9.60 17 18
10.23 19
10.45
11.05 20
11.28 11.41 11.59 22 21
11.79 12.13 12.38 24
12.51 12.74 26 27
25
13.87 28
14.29 14.52 29 30
15.01 15.12 31
15.23 32
15.41 15.55 15.70 33
16.12 16.31 16.39 16.49 34A 34B
16.61 35
16.99 17.25 17.15 IS #1 17.37 36
17.50
17.69 17.81 18.04
18.26
18.69 18.97 18.75 37
19.57 19.64 19.78 38 39
20.18 20.28
20.70 20.89 40
21.02
21.15 41A
21.65 21.73 21.91 42
22.08 43 44
22.18 22.31 22.50 45 45A
22.60 22.74 22.87 46B
22.68
23.26 23.36 23.48 23.63 23.72 47
23.88 23.99 24.08 24.23 48
24.23 24.43 49
24.57 24.85
25.03
25.22 25.46 25.55 25.73 50
26.05 26.16 26.31 26.48 51
26.70 26.85 52 53
27.01 27.23
27.15 27.41
27.65 54
27.85 27.99 28.09 28.14
28.23 55
28.40 28.56 28.66 28.75 28.82 56 57
29.00 29.17 29.25 29.43 29.53 58 59
29.78 29.92 30.04 30.13 30.28 61
29.68 60
30.19 30.43 30.57
30.81 30.99 62 I.S. #2
31.11 31.33
31.51 31.74 31.85 32.02 32.11 63 64
32.19 32.34 32.55 32.62 32.86 65
32.75 32.96 33.16 33.53 66
33.25 33.43 33.62
33.77 33.84
33.99 67
34.11 68
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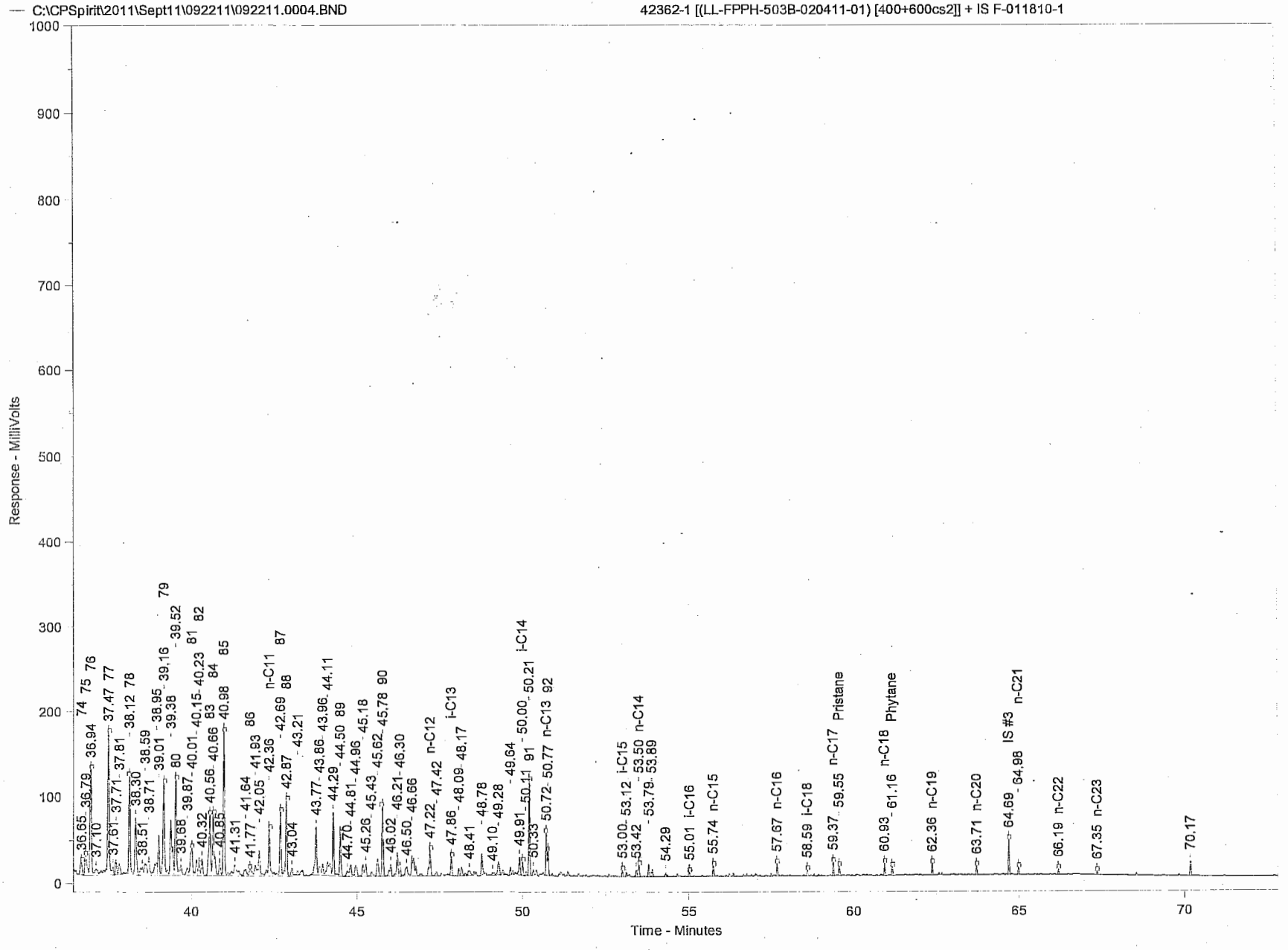
35.63 72
35.75
35.92 73
36.06 36.16 36.27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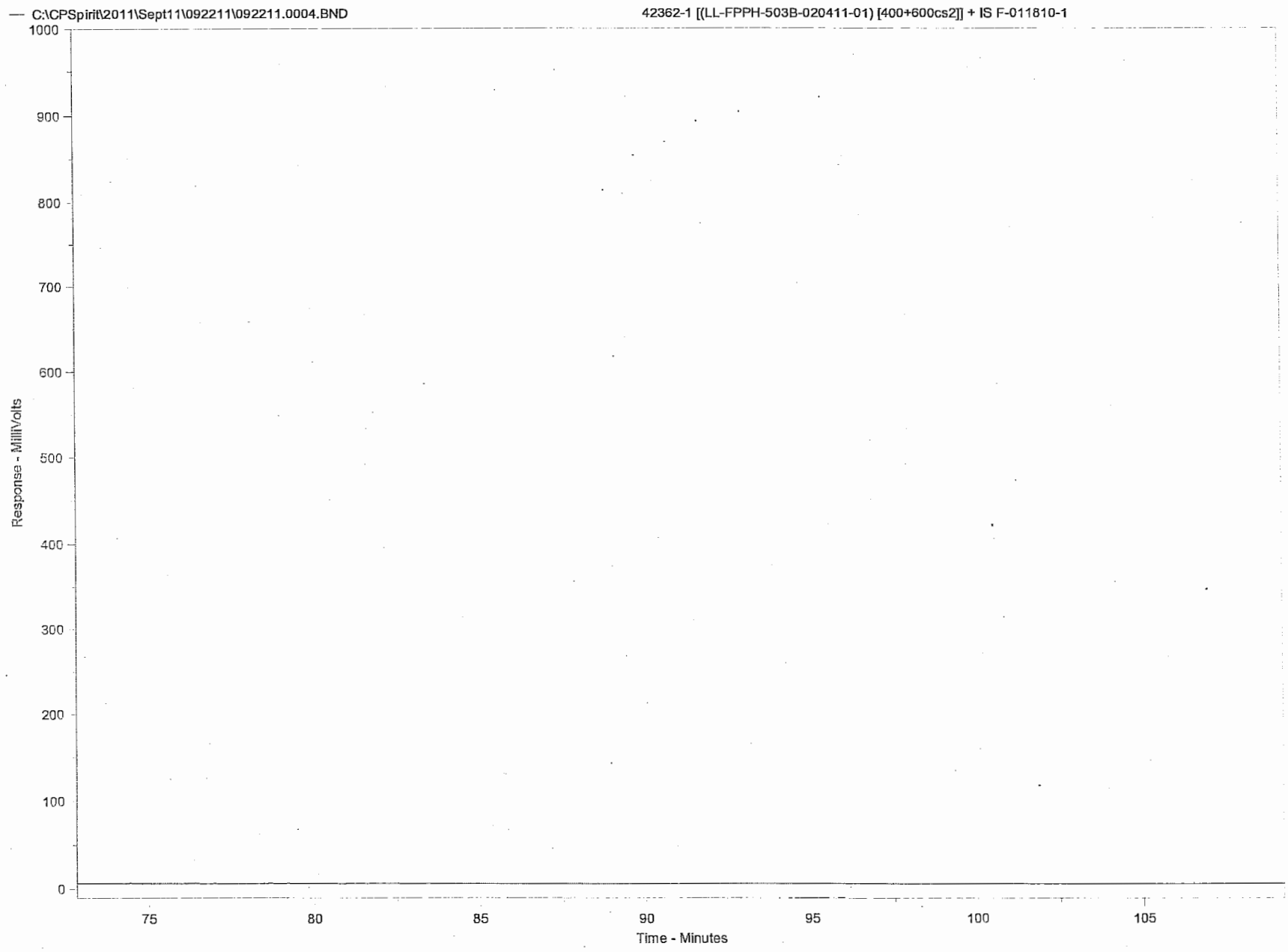
42362-1 [(LL-FPPH-503B-020411-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
1000
900
800
700
600
500
400
300
200
100
0
40
45
50
55
60
65
70
74 75 76
36.65 36.79 36.94
37.10
37.47 77
37.61 37.71 37.81
38.12 78
38.30 38.51 38.59
38.71
38.95 39.16 79
39.01
39.52
81 82
39.38
39.87 40.01 40.15 40.23
80
40.32 40.56 40.66 83
40.85
84 85
40.98
41.31
41.64 41.77 41.93 86
42.05 42.36
n-C11 87
42.69 88
42.87 43.04 43.21
43.77 43.86 43.96 44.11
44.29 44.50 89
44.70 44.81 44.96 45.18
45.26 45.43 45.62 45.78 90
46.02 46.21 46.30
46.50 46.66
n-C12
47.22 47.42
47.86 48.09 48.17
i-C13
48.41 48.78
49.10 49.28
49.64
49.91 50.11 91
50.00 50.21
i-C14
50.33 50.72 50.77 n-C13 92
53.00 53.12 i-C15
53.42 53.50 n-C14
53.79 53.89
54.29
55.01 i-C16
55.74 n-C15
57.67 n-C16
58.59 i-C18
59.37 59.55 n-C17 Pristane
60.93 61.16 n-C18 Phytane
62.36 n-C19
63.71 n-C20
64.69 64.98 IS #3 n-C21
66.19 n-C22
67.35 n-C23
70.17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42362-1 [(LL-FPPH-503B-020411-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
1000
900
800
700
600
500
400
300
200
100
0
75
80
85
90
95
100
105
Time - Minutes

Sample Name = **42362-1 [(LL-FPPH-503B-020411-01) [400+600cs2]] + IS F-011810-1**

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Heading 1 =
Heading 2 =

Acquisition Port = DP#

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Method File Name = C:\CPSpirit\2011\Sept11\092211\092211.0004.BND
Calibration File Name = C:\CPSpirit\2011\Sept11\092211\092211.0004.BND

Date Taken (end) = 9/23/2011 2:49:21 AM
Method Version = 44
Calibration Version = 5

Peak Name	Ret. Time	Area %	Area
2	5.76	0.0756	34857.06
8	6.95	0.0878	40444.57
11	7.46	0.0862	39746.75
14	7.94	0.0248	11415.94
CS2	8.27	0.3351	154451.00
	9.39	0.0428	19706.69
17	9.45	0.1408	64886.63
18	9.60	0.4538	209167.30
19	10.23	0.3877	178669.70
	10.45	0.0420	19368.00
20	11.05	0.5601	258143.20
	11.29	0.0488	22471.41
21	11.41	0.0647	29812.02
22	11.59	0.0571	26334.72
	11.79	0.0305	14076.72
24	12.13	0.0683	31494.46
25	12.38	0.0512	23596.56
26	12.51	0.7839	361282.10
27	12.74	0.7210	332309.10
28	13.87	0.1710	78821.10
29	14.29	0.0747	34428.20
30	14.52	0.4144	190979.30
	15.01	0.0422	19437.57
31	15.12	1.0356	477309.30
32	15.23	2.2060	1016730.00
	15.41	0.1627	74963.73
	15.55	0.0253	11640.66
33	15.70	1.3117	604544.40
	16.12	0.5896	271756.30
34A	16.31	0.5669	261289.90
	16.39	0.1769	81511.76
34B	16.49	0.7519	346516.70
35	16.61	2.6856	1237736.00
	16.99	0.0328	15115.74
IS #1	17.15	0.6477	298499.00
	17.25	0.1463	67418.56
36	17.37	1.4236	656137.40
	17.50	0.1293	59614.14
	17.69	0.0596	27487.54
	17.81	0.0306	14116.00
	18.04	0.1402	64603.73
	18.26	0.0727	33501.71
	18.69	0.2363	108914.50
37	18.75	1.4851	684459.40
	18.97	0.3957	182366.90
	19.57	0.3507	161616.50
38	19.64	0.5161	237872.20
39	19.78	0.8781	404695.60
	20.18	0.4502	207471.60
	20.28	0.1140	52530.83
	20.70	0.5837	269038.90
40	20.89	1.3027	600412.20
	21.02	0.0624	28780.77
41A	21.15	2.3719	1093184.00
42	21.65	0.6980	321699.40

Peak Name	Ret. Time	Area %	Area
	21.73	0.2470	113837.10
	21.91	0.0985	45419.18
43	22.08	1.3419	618447.20
44	22.18	0.5728	264008.00
45	22.31	0.2455	113144.00
	22.50	0.1638	75509.01
46B	22.60	1.3654	629304.30
	22.68	0.3366	155136.40
46A	22.74	1.0538	485672.70
	22.87	0.3194	147210.50
	23.26	0.1933	89104.64
47	23.36	0.5302	244361.70
	23.48	0.3038	140014.80
	23.63	0.2765	127454.40
48	23.72	0.3733	172061.90
	23.88	0.0846	38986.98
	23.99	0.0839	38670.25
	24.08	0.6450	297259.20
	24.23	0.1560	71882.52
49	24.43	1.4005	645451.20
	24.57	0.4379	201820.40
	24.67	0.0381	17553.76
	24.85	0.2456	113204.30
	25.03	0.1473	67886.11
	25.22	0.0226	10401.62
	25.46	0.0493	22725.06
50	25.55	0.1193	54966.83
	25.73	0.2864	131999.70
	26.05	0.2927	134878.00
51	26.16	0.2637	121513.90
	26.31	0.0412	18969.79
52	26.48	1.2371	570177.70
	26.70	0.1218	56145.26
53	26.85	0.9857	454274.50
	26.91	0.5698	262600.40
	27.01	0.3134	144442.10
	27.15	0.0982	45238.09
	27.23	0.1689	77852.09
	27.41	0.0401	18495.54
54	27.65	2.2175	1022006.00
	27.85	0.4119	189855.00
	27.99	0.0833	38383.53
	28.09	0.0540	24905.64
	28.14	0.0006	268.00
55	28.23	8.6394	3981774.00
	28.40	0.1243	57278.31
	28.56	0.1672	77040.20
	28.66	0.2666	122888.60
56	28.75	0.6724	309880.80
57	28.82	0.5957	274568.00
	29.00	0.0401	18492.76
58	29.17	0.2952	136063.40
59	29.25	0.9340	430451.20
	29.43	0.0951	43848.27
	29.53	0.1496	68934.68
60	29.68	2.6202	1207629.00
61	29.78	0.3028	139560.90
	29.92	0.0425	19582.66
	30.04	0.2803	129189.40
	30.13	0.5216	240399.90
	30.19	0.1871	86223.37
	30.28	0.3467	159781.70
	30.43	0.0632	29105.84
	30.57	0.1562	71984.35
	30.81	0.0466	21488.16
62	30.99	1.1178	515195.80
I.S. #2	31.11	0.2294	105742.90

Peak Name	Ret. Time	Area %	Area
	31.33	0.4037	186078.20
	31.51	0.1361	62716.81
63	31.74	0.1880	86652.55
	31.85	0.0968	44607.20
64	32.02	0.3780	174210.90
	32.11	0.2700	124456.00
	32.19	0.2010	92639.12
	32.34	0.0341	15738.38
	32.55	0.0491	22639.43
	32.62	0.2903	133798.00
	32.75	0.3077	141822.80
	32.86	0.1839	84779.42
	32.96	0.1971	90829.00
65	33.16	0.6067	279605.80
	33.25	0.1270	58544.41
	33.43	0.1032	47548.75
66	33.53	0.8993	414455.70
	33.62	0.4202	193682.90
	33.77	0.0558	25728.96
	33.84	0.1392	64135.76
67	33.99	2.2180	1022225.00
68	34.11	1.2589	580219.40
69	34.45	2.1465	989306.30
	34.67	0.2746	126563.00
	34.78	0.4482	206573.10
70	34.89	0.6903	318166.60
71	35.02	0.8362	385396.70
	35.14	0.0977	45006.14
	35.32	0.2788	128487.10
	35.63	0.1941	89476.11
72	35.75	0.0436	20106.27
73	35.92	4.7225	2176527.00
	36.08	0.1681	77489.57
	36.16	0.1441	66415.76
	36.27	0.0820	37802.23
74	36.65	0.1305	60159.57
75	36.79	0.2330	107389.60
76	36.94	0.7863	362376.60
	37.10	0.1014	46735.89
77	37.47	1.1708	539607.40
	37.61	0.0759	34985.87
	37.71	0.1065	49093.07
	37.81	0.0930	42842.59
78	38.12	0.6693	308471.30
	38.30	0.4740	218437.50
	38.51	0.1207	55615.11
	38.59	0.1574	72564.16
	38.71	0.1570	72372.44
	38.95	0.2064	95144.48
	39.01	0.2742	126383.70
79	39.16	0.7548	347881.70
	39.38	0.6019	277401.90
80	39.52	0.6843	315381.60
	39.68	0.0922	42476.11
	39.87	0.0844	38899.80
81	40.01	0.3597	165779.40
	40.15	0.1202	55398.73
82	40.23	0.0930	42863.04
	40.32	0.1289	59418.56
83	40.56	0.5601	258123.70
84	40.66	0.5660	260869.00
	40.85	0.1300	59916.11
85	40.98	1.0069	464085.90
	41.31	0.1979	91205.63
	41.64	0.0984	45343.08
86	41.77	0.1080	49793.78
	41.93	0.0979	45130.79

Peak Name	Ret. Time	Area %	Area
	42.05	0.2646	121950.60
n-C11	42.36	0.4437	204475.20
87	42.69	0.4570	210630.90
88	42.87	0.5429	250228.70
	43.04	0.0735	33855.88
	43.21	0.0315	14521.26
	43.77	0.4060	187137.50
	43.86	0.1015	46760.21
	43.96	0.0827	38104.63
	44.11	0.1426	65716.09
	44.29	0.4552	209793.70
89	44.50	0.2986	137629.00
	44.70	0.0634	29214.72
	44.81	0.1261	58134.73
	44.96	0.1305	60167.59
	45.18	0.0901	41503.70
	45.26	0.1039	47881.13
	45.43	0.0523	24100.25
	45.62	0.1557	71743.16
90	45.78	0.4715	217302.40
	46.02	0.1253	57737.79
	46.21	0.1935	89170.23
	46.30	0.0982	45239.37
	46.50	0.1342	61834.78
	46.66	0.3361	154888.40
n-C12	47.22	0.2270	104625.50
	47.42	0.0456	21032.95
i-C13	47.86	0.1246	57417.54
	48.09	0.0448	20648.82
	48.17	0.0654	30128.11
	48.41	0.0620	28574.75
	48.78	0.1429	65873.29
	49.10	0.0320	14751.30
	49.28	0.1227	56560.21
	49.64	0.0412	18968.89
	49.91	0.1159	53404.28
i-C14	50.00	0.0735	33877.34
	50.11	0.0243	11191.37
91	50.21	0.5113	235632.20
	50.33	0.0322	14845.37
n-C13	50.72	0.2232	102849.20
92	50.77	0.1216	56036.64
i-C15	53.00	0.0332	15299.25
	53.12	0.0177	8141.99
	53.42	0.0375	17274.71
n-C14	53.50	0.0913	42078.97
	53.79	0.0687	31676.44
	53.89	0.0412	18982.37
	54.29	0.0306	14107.55
i-C16	55.01	0.0286	13173.83
n-C15	55.74	0.0624	28777.47
n-C16	57.67	0.0633	29185.42
i-C18	58.59	0.0317	14596.72
n-C17	59.37	0.0619	28523.82
Pristane	59.55	0.0540	24887.68
n-C18	60.93	0.0549	25310.12
Phytane	61.16	0.0452	20840.43
n-C19	62.36	0.0579	26675.39
n-C20	63.71	0.0441	20347.99
IS #3	64.69	0.1589	73250.41
n-C21	64.98	0.0334	15388.11
n-C22	66.19	0.0260	11976.11
n-C23	67.35	0.0183	8420.12
	70.17	0.0798	36774.03

Total Area = 4.608844E+07 Total Height = 1.540958E+07 Total Amount = 1

ZymaX FORENSICS

9/22/2011

ZymaX ID	42362-2
Sample ID	LL-FPPH-EW1-091411-01

Evaporation

n-Pentane / n-Heptane	0.00
2-Methylpentane / 2-Methylheptane	1.22

Waterwashing

Benzene / Cyclohexane	0.00
Toluene / Methylcyclohexane	0.03
Aromatics / Total Paraffins (n+iso+cyc)	0.50
Aromatics / Naphthenes	1.80

Biodegradation

(C4 - C8 Para + Isopara) / C4 - C8 Olefins	82.49
3-Methylhexane / n-Heptane	0.00
Methylcyclohexane / n-Heptane	0.00
Isoparaffins + Naphthenes / Paraffins	340.74

Octane rating

2,2,4,-Trimethylpentane / Methylcyclohexane	0.00

Relative percentages - Bulk hydrocarbon composition as PIANO

% Paraffinic	0.19
% Isoparaffinic	46.59
% Aromatic	32.58
% Naphthenic	18.07
% Olefinic	2.57

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

ZymaX FORENSICS

9/22/2011

ZymaX ID 42362-2
Sample ID LL-FPPH-EW1-091411-01

		Relative Area %
1	Propane	0.00
2	Isobutane	0.88
3	Isobutene	0.00
4	Butane/Methanol	0.00
5	trans-2-Butene	0.00
6	cis-2-Butene	0.00
7	3-Methyl-1-butene	0.00
8	Isopentane	0.71
9	1-Pentene	0.00
10	2-Methyl-1-butene	0.00
11	Pentane	0.19
12	trans-2-Pentene	0.00
13	cis-2-Pentene/t-Butanol	0.00
14	2-Methyl-2-butene	0.00
15	2,2-Dimethylbutane	0.14
16	Cyclopentane	0.00
17	2,3-Dimethylbutane/MTBE	0.78
18	2-Methylpentane	1.45
19	3-Methylpentane	2.82
20	Hexane	0.00
21	trans-2-Hexene	0.00
22	3-Methylcyclopentene	0.00
23	3-Methyl-2-pentene	0.00
24	cis-2-Hexene	0.00
25	3-Methyl-trans-2-pentene	0.30
26	Methylcyclopentane	0.23
27	2,4-Dimethylpentane	0.81
28	Benzene	0.00
29	5-Methyl-1-hexene	0.27
30	Cyclohexane	1.29
31	2-Methylhexane/TAME	0.39
32	2,3-Dimethylpentane	2.61
33	3-Methylhexane	1.26
34A	1-trans-3-Dimethylcyclopentane	3.26
34B	1-cis-3-Dimethylcyclopentane	4.30
35	2,2,4-Trimethylpentane	0.00
I.S. #1	à,à,à-Trifluorotoluene	0.00

ZymaX FORENSICS

9/22/2011

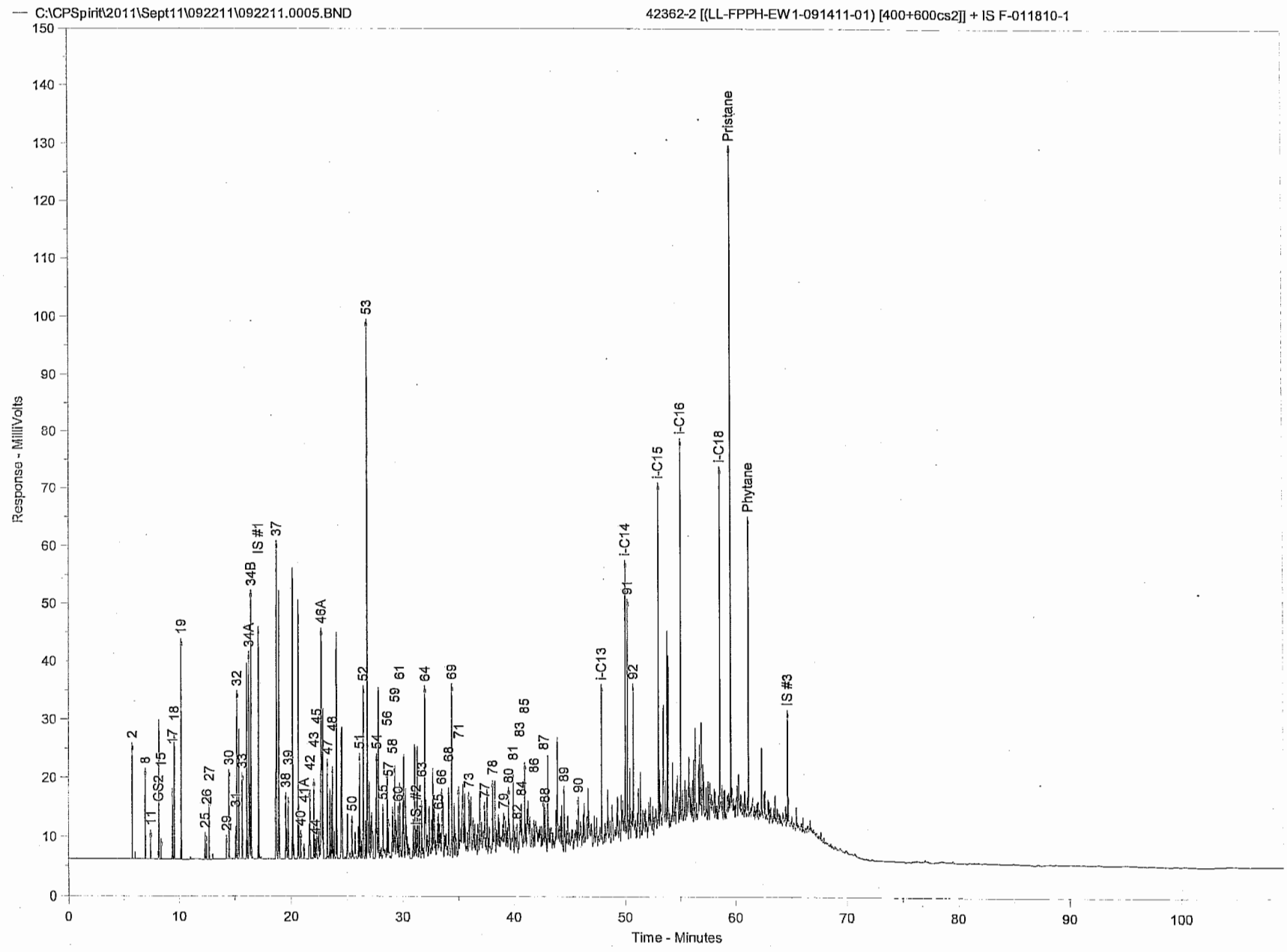
ZymaX ID		42362-2
Sample ID		LL-FPPH-EW1-091411-01
		Relative Area %
36	n-Heptane	0.00
37	Methylcyclohexane	5.35
38	2,5-Dimethylhexane	0.97
39	2,4-Dimethylhexane	1.00
40	2,3,4-Trimethylpentane	0.38
41	Toluene/2,3,3-Trimethylpentane	0.13
42	2,3-Dimethylhexane	1.33
43	2-Methylheptane	1.19
44	4-Methylheptane	0.18
45	3,4-Dimethylhexane	0.41
46A	3-Ethyl-3-methylpentane	6.73
46B	1,4-Dimethylcyclohexane	0.00
47	3-Methylheptane	1.61
48	2,2,5-Trimethylhexane	1.47
49	n-Octane	0.00
50	2,2-Dimethylheptane	0.59
51	2,4-Dimethylheptane	1.90
52	Ethylcyclohexane	3.65
53	2,6-Dimethylheptane	10.14
54	Ethylbenzene	1.99
55	m+p Xylenes	0.87
56	4-Methyloctane	1.32
57	2-Methyloctane	0.58
58	3-Ethylheptane	0.47
59	3-Methyloctane	1.42
60	o-Xylene	0.76
61	1-Nonene	1.51
62	n-Nonane	0.00
I.S.#2	p-Bromofluorobenzene	0.00
63	Isopropylbenzene	0.84
64	3,3,5-Trimethylheptane	2.61
65	2,4,5-Trimethylheptane	0.43
66	n-Propylbenzene	1.69
67	1-Methyl-3-ethylbenzene	0.00
68	1-Methyl-4-ethylbenzene	1.62
69	1,3,5-Trimethylbenzene	3.41
70	3,3,4-Trimethylheptane	0.00

ZymaX FORENSICS

9/22/2011

ZymaX ID 42362-2
Sample ID LL-FPPH-EW1-091411-01

		Relative Area %
71	1-Methyl-2-ethylbenzene	1.04
72	3-Methylnonane	0.00
73	1,2,4-Trimethylbenzene	1.29
74	Isobutylbenzene	0.00
75	sec-Butylbenzene	0.00
76	n-Decane	0.00
77	1,2,3-Trimethylbenzene	2.09
78	Indan	1.22
79	1,3-Diethylbenzene	0.49
80	1,4-Diethylbenzene	0.66
81	n-Butylbenzene	1.30
82	1,3-Dimethyl-5-ethylbenzene	0.51
83	1,4-Dimethyl-2-ethylbenzene	1.45
84	1,3-Dimethyl-4-ethylbenzene	0.94
85	1,2-Dimethyl-4-ethylbenzene	1.72
86	Undecene	0.49
87	1,2,4,5-Tetramethylbenzene	0.62
88	1,2,3,5-Tetramethylbenzene	0.45
89	1,2,3,4-Tetramethylbenzene	1.36
90	Naphthalene	0.84
91	2-Methyl-naphthalene	3.38
92	1-Methyl-naphthalene	1.91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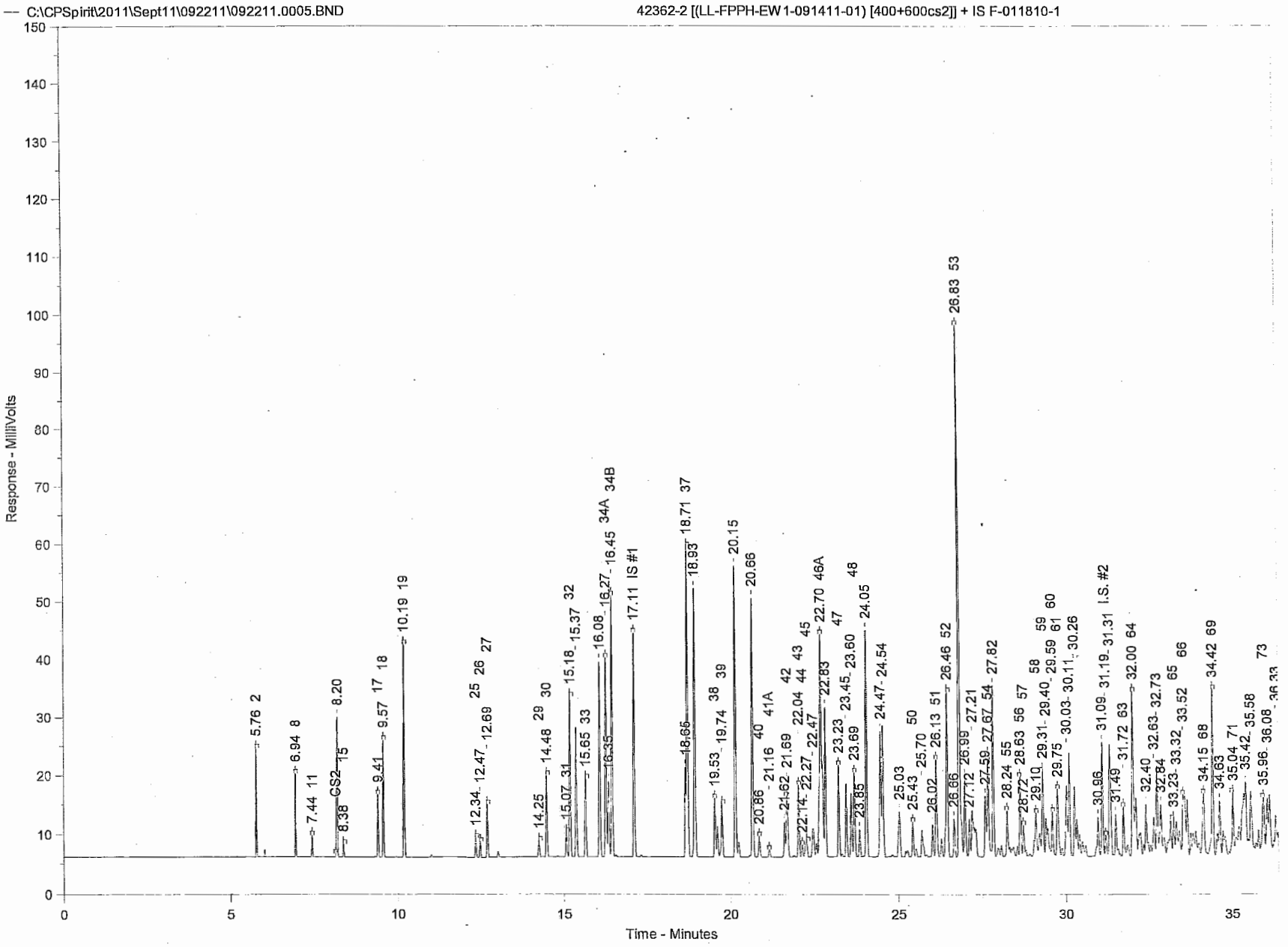
42362-2 [(LL-FPPH-EW1-091411-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
Pristane
Phytane
i-C13
i-C14
i-C15
i-C16
i-C18
IS #1
IS #2
IS #3
GS2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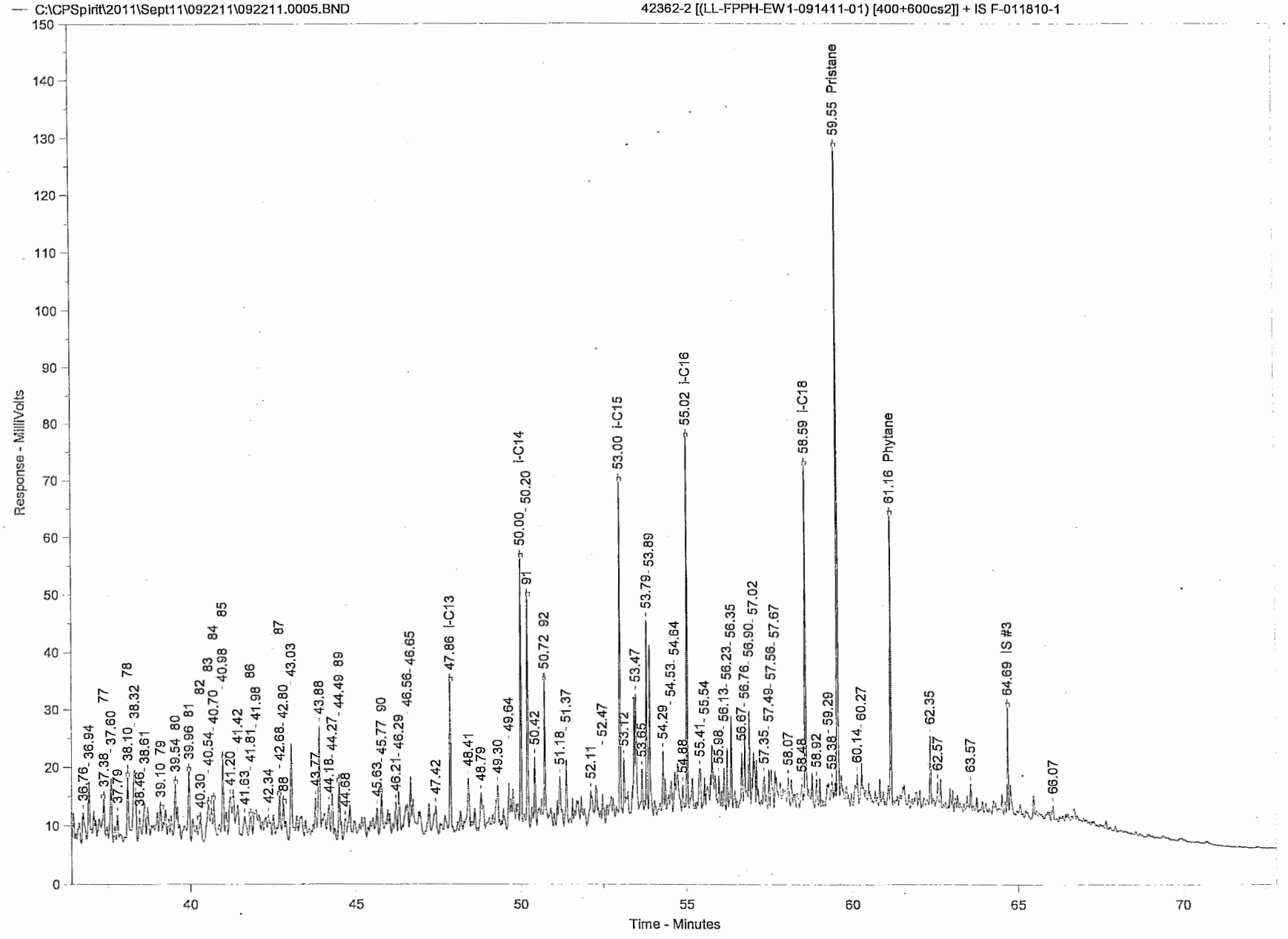
42362-2 [(LL-FPPH-EW1-091411-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
0
5
10
15
20
25
30
35
5.76 2
6.94 8
7.44 11
8.20
CS2 15
8.38
9.41
9.57 17 18
10.19 19
12.34
12.47
12.69 25 26 27
14.25
14.48 29 30
15.07 31
15.18
15.37 32
15.65 33
16.08
16.27
16.35
16.45 34A 34B
17.11 IS #1
18.65
18.71 37
18.93
19.53
19.74 38 39
20.15
20.66
20.86
21.16 40 41A
21.62
21.69 42 43 44 45
22.04
22.14
22.27
22.47
22.70 46A
22.83 47
23.23
23.45
23.60 48
23.69
23.85
24.05
24.47
24.54
25.03
25.43
25.70 50
26.02
26.13 51
26.46 52
26.66
26.83 53
26.99
27.12
27.21
27.59
27.67 54
27.82
28.24 55
28.63 56 57
28.72
29.10
29.31
29.40 58
29.59 59 61 60
29.75
30.03
30.11
30.26
30.86
31.09
31.19
31.31 I.S. #2
31.49
31.72 63
32.00 64
32.40
32.63
32.73
32.84
33.23
33.32
33.52 65 66
34.15 68
34.42 69
34.63
35.04 71
35.42
35.58
35.96
36.08
73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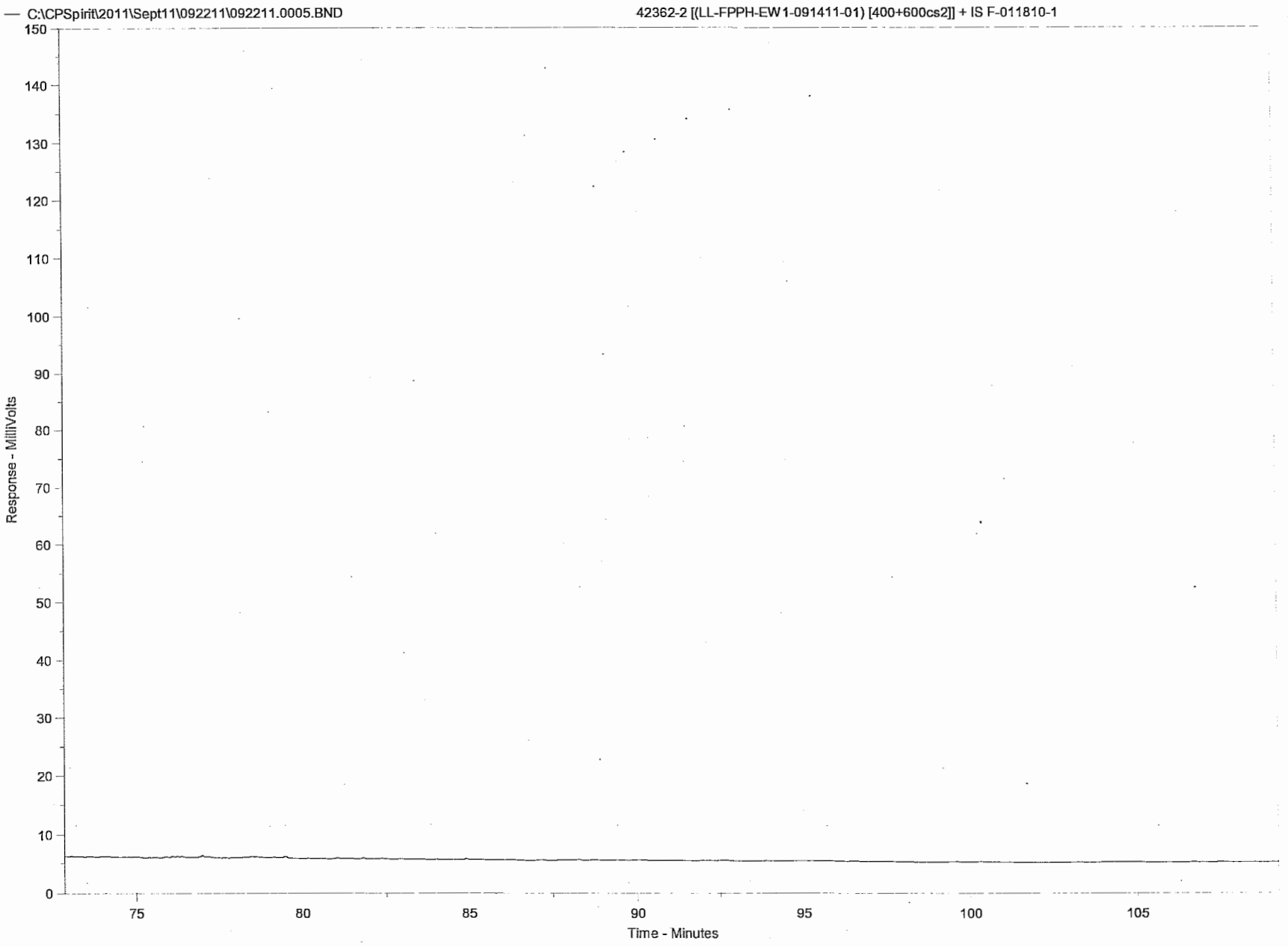
42362-2 [(LL-FPPH-EW1-091411-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
Pristane
i-C14
i-C15
i-C16
i-C13
i-C18
Phytane
IS #3


C:\CPSpirit\2011\Sept11\092211\092211.0005.BND
42362-2 [(LL-FPPH-EW1-091411-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
75
80
85
90
95
100
105
Time - Minutes

Sample Name = **42362-2 [(LL-FPPH-EW1-091411-01) [400+600cs2]] + IS F-011810-1**

Instrument = Instrument 1
Heading 1 =
Heading 2 =

Acquisition Port = DP#

Raw File Name = **C:\CPSpirit\2011\Sept11\092211\092211.0005.RAW**
Method File Name = C:\CPSpirit\C344.met
Calibration File Name = C:\CPSpirit\2011\Sept11\092211\092211.0005.BND

Date Taken (end) = 9/23/2011 5:01:19 AM
Method Version = 44
Calibration Version = 5

Peak Name	Ret. Time	Area %	Area
2	5.76	0.3152	22982.00
8	6.94	0.2557	18643.10
11	7.44	0.0683	4977.37
	8.20	0.7032	51266.38
15	8.38	0.0510	3720.52
17	9.41	0.2793	20363.20
18	9.57	0.5228	38115.09
19	10.19	1.0156	74049.58
25	12.34	0.1079	7868.54
26	12.47	0.0822	5993.70
27	12.69	0.2902	21161.17
29	14.25	0.0961	7003.45
30	14.48	0.4632	33769.76
31	15.07	0.1389	10128.44
32	15.18	0.9393	68485.18
	15.37	0.7695	56102.11
33	15.65	0.4545	33139.67
	16.08	1.1413	83209.21
34A	16.27	1.1732	85539.15
	16.35	0.4357	31765.61
34B	16.45	1.5467	112771.20
IS #1	17.11	1.2927	94248.37
	18.65	0.5045	36782.44
37	18.71	1.9236	140251.00
	18.93	1.7181	125263.00
38	19.53	0.3507	25565.95
39	19.74	0.3587	26152.20
	20.15	1.7680	128902.10
	20.66	1.5859	115629.90
40	20.86	0.1369	9980.70
41A	21.16	0.0482	3516.41
	21.62	0.2130	15527.07
42	21.69	0.4772	34791.05
43	22.04	0.4284	31232.35
44	22.14	0.0648	4724.80
45	22.27	0.1491	10872.18
	22.47	0.2712	19771.77
46A	22.70	2.4199	176432.10
	22.83	0.9213	67172.74
47	23.23	0.5789	42204.89
	23.45	0.4413	32171.51
	23.60	0.3879	28279.55
48	23.69	0.5280	38498.68
	23.85	0.1716	12508.61
	24.05	1.4184	103411.30
	24.47	0.8712	63520.00
	24.54	0.8414	61348.57
	25.03	0.3951	28809.82
50	25.43	0.2113	15409.01
	25.70	0.2265	16515.60
	26.02	0.2052	14962.13
51	26.13	0.6852	49956.79
52	26.46	1.3127	95708.41
	26.66	0.2382	17366.73
53	26.83	3.6464	265859.40

Peak Name	Ret. Time	Area %	Area
	26.99	0.5380	39225.97
	27.12	0.2342	17077.19
	27.21	0.6671	48638.98
	27.59	0.4324	31527.19
54	27.67	0.7146	52104.05
	27.82	1.0749	78368.12
55	28.24	0.3143	22917.02
56	28.63	0.4761	34710.85
57	28.72	0.2093	15258.24
58	29.10	0.1701	12404.00
59	29.31	0.5109	37251.32
	29.40	0.4038	29442.71
60	29.59	0.2751	20056.59
61	29.75	0.5444	39688.52
	30.03	0.5788	42197.42
	30.11	0.6869	50081.36
	30.26	0.3356	24466.75
	30.96	0.3176	23156.01
	31.09	0.7387	53857.68
I.S. #2	31.19	0.1103	8044.89
	31.31	0.9623	70161.96
	31.49	0.3211	23413.87
63	31.72	0.3039	22157.85
64	32.00	0.9382	68401.38
	32.40	0.3303	24083.05
	32.63	0.2313	16866.89
	32.73	0.5077	37014.00
	32.84	0.3242	23634.40
65	33.23	0.1554	11332.34
	33.32	0.1416	10323.64
66	33.52	0.6090	44404.29
68	34.15	0.5836	42551.46
69	34.42	1.2272	89472.38
	34.63	0.5219	38048.11
71	35.04	0.3726	27162.42
	35.42	0.9898	72162.14
	35.58	0.4575	33355.18
73	35.96	0.4651	33913.34
	36.08	0.2135	15564.03
	36.33	0.2272	16567.58
	36.76	0.3435	25042.08
	36.94	0.5588	40744.29
77	37.38	0.7527	54881.74
	37.60	0.5280	38498.39
	37.79	0.1329	9688.21
78	38.10	0.4383	31956.15
	38.32	0.9451	68903.70
	38.46	0.1945	14177.54
	38.61	0.3125	22784.30
79	39.10	0.1746	12729.38
80	39.54	0.2368	17267.13
81	39.96	0.4669	34043.73
82	40.30	0.1835	13381.64
83	40.54	0.5208	37970.64
84	40.70	0.3398	24771.21
85	40.98	0.6178	45042.25
	41.20	0.4703	34285.82
	41.42	0.4226	30811.09
	41.63	0.2473	18032.48
86	41.81	0.1778	12963.40
	41.98	0.2324	16941.79
	42.34	0.3492	25463.52
87	42.68	0.2228	16240.82
88	42.80	0.1605	11701.21
	43.03	0.6977	50865.26
	43.77	0.1803	13148.88
	43.88	0.7630	55631.99

Peak Name	Ret. Time	Area %	Area
	44.18	0.2469	17999.37
	44.27	0.2400	17498.78
89	44.49	0.4884	35610.79
	44.68	0.1338	9757.64
	45.63	0.1726	12584.49
90	45.77	0.3004	21899.83
	46.21	0.1852	13505.82
	46.29	0.2808	20472.81
	46.56	0.3325	24240.23
	46.65	0.2320	16915.56
	47.42	0.3445	25120.43
i-C13	47.86	0.9344	68129.97
	48.41	0.3879	28284.56
	48.79	0.1475	10750.94
	49.30	0.4255	31020.40
	49.64	0.1831	13346.24
i-C14	50.00	1.3332	97205.57
91	50.20	1.2153	88605.35
	50.42	0.3697	26955.64
92	50.72	0.6865	50050.15
	51.18	0.3695	26942.32
	51.37	0.4270	31132.29
	52.11	0.5310	38713.56
	52.47	0.2265	16517.47
i-C15	53.00	1.5614	113841.00
	53.12	0.5170	37691.38
	53.47	1.4831	108129.50
	53.65	0.3557	25936.59
	53.79	0.9093	66293.52
	53.89	0.9236	67338.89
	54.29	0.3331	24286.41
	54.53	0.3838	27985.23
	54.64	0.1410	10281.03
	54.88	0.1550	11301.41
i-C16	55.02	1.7802	129791.70
	55.41	0.3713	27068.86
	55.54	0.1504	10963.18
	55.98	0.1404	10235.30
	56.13	0.2050	14948.40
	56.23	0.2696	19658.15
	56.35	0.4824	35168.45
	56.67	0.2838	20689.94
	56.76	0.3377	24624.01
	56.90	0.5125	37363.59
	57.02	0.3011	21955.49
	57.35	0.1932	14087.09
	57.49	0.1654	12060.83
	57.56	0.3030	22089.59
	57.67	0.2977	21708.07
	58.07	0.1685	12286.88
	58.48	0.2145	15639.50
i-C18	58.59	1.8638	135889.90
	58.92	0.1758	12815.86
	59.29	0.2536	18492.67
	59.38	0.2658	19376.17
Pristane	59.55	3.3308	242848.70
	60.14	0.3663	26709.97
	60.27	0.3032	22107.81
Phytane	61.16	1.5814	115302.20
	62.35	0.3551	25887.45
	62.57	0.1263	9205.77
	63.57	0.1315	9587.42
IS #3	64.69	0.4493	32757.28
	66.07	0.1348	9825.10

Total Area = 7290927 Total Height = 2584636 Total Amount = 1

ZymaX FORENSICS

9/22/2011

ZymaX ID	42362-3
Sample ID	LL-FPPH-W11-120810-01

Evaporation

n-Pentane / n-Heptane	0.00
2-Methylpentane / 2-Methylheptane	0.26

Waterwashing

Benzene / Cyclohexane	0.00
Toluene / Methylcyclohexane	0.00
Aromatics / Total Paraffins (n+iso+cyc)	0.37
Aromatics / Naphthenes	1.09

Biodegradation

(C4 - C8 Para + Isopara) / C4 - C8 Olefins	0.00
3-Methylhexane / n-Heptane	1.98
Methylcyclohexane / n-Heptane	20.97
Isoparaffins + Naphthenes / Paraffins	5.82

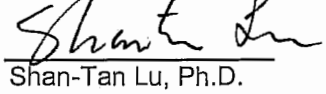
Octane rating

2,2,4,-Trimethylpentane / Methylcyclohexane	0.00

Relative percentages - Bulk hydrocarbon composition as PIANO

% Paraffinic	10.59
% Isoparaffinic	37.00
% Aromatic	26.79
% Naphthenic	24.58
% Olefinic	1.05

Submitted by,
Zymax Forensics, a DPRA Company



Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

ZymaX FORENSICS

9/22/2011

ZymaX ID	42362-3
Sample ID	LL-FPPH-W11-120810-01

		Relative Area %
1	Propane	0.00
2	Isobutane	0.42
3	Isobutene	0.00
4	Butane/Methanol	0.00
5	trans-2-Butene	0.00
6	cis-2-Butene	0.00
7	3-Methyl-1-butene	0.00
8	Isopentane	0.21
9	1-Pentene	0.00
10	2-Methyl-1-butene	0.00
11	Pentane	0.00
12	trans-2-Pentene	0.00
13	cis-2-Pentene/t-Butanol	0.00
14	2-Methyl-2-butene	0.00
15	2,2-Dimethylbutane	0.00
16	Cyclopentane	0.00
17	2,3-Dimethylbutane/MTBE	0.14
18	2-Methylpentane	0.50
19	3-Methylpentane	0.65
20	Hexane	0.10
21	trans-2-Hexene	0.00
22	3-Methylcyclopentene	0.00
23	3-Methyl-2-pentene	0.00
24	cis-2-Hexene	0.00
25	3-Methyl-trans-2-pentene	0.00
26	Methylcyclopentane	1.40
27	2,4-Dimethylpentane	0.21
28	Benzene	0.00
29	5-Methyl-1-hexene	0.00
30	Cyclohexane	1.69
31	2-Methylhexane/TAME	0.45
32	2,3-Dimethylpentane	0.66
33	3-Methylhexane	0.96
34A	1-trans-3-Dimethylcyclopentane	1.28
34B	1-cis-3-Dimethylcyclopentane	1.85
35	2,2,4-Trimethylpentane	0.00
I.S. #1	à,à,à-Trifluorotoluene	0.00

ZymaX FORENSICS

9/22/2011

ZymaX ID 42362-3
Sample ID LL-FPPH-W11-120810-01

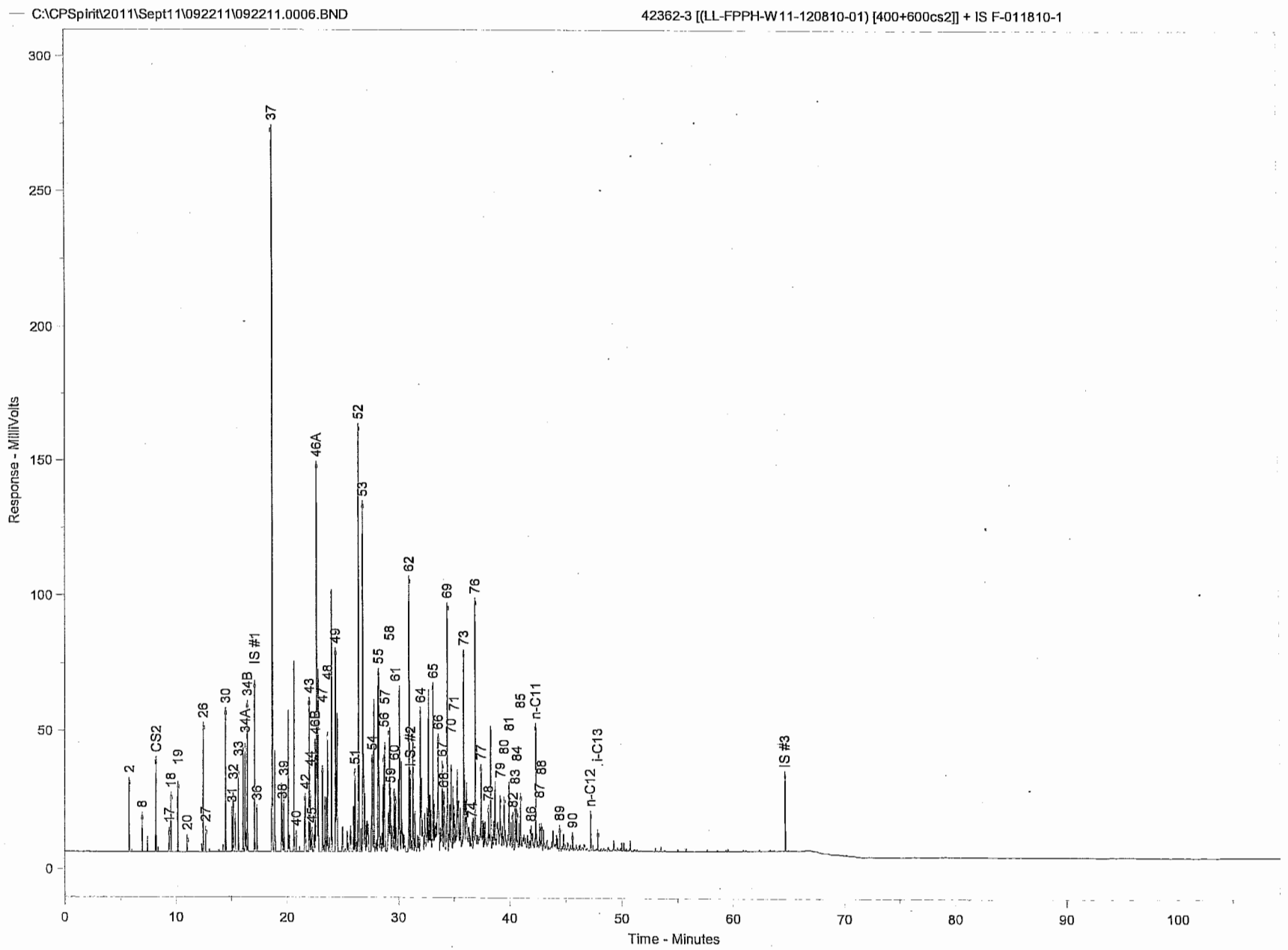
		Relative Area %
36	n-Heptane	0.48
37	Methylcyclohexane	10.16
38	2,5-Dimethylhexane	0.53
39	2,4-Dimethylhexane	0.71
40	2,3,4-Trimethylpentane	0.18
41	Toluene/2,3,3-Trimethylpentane	0.00
42	2,3-Dimethylhexane	0.83
43	2-Methylheptane	1.93
44	4-Methylheptane	0.70
45	3,4-Dimethylhexane	0.37
46A	3-Ethyl-3-methylpentane	6.98
46B	1,4-Dimethylcyclohexane	1.39
47	3-Methylheptane	1.07
48	2,2,5-Trimethylhexane	1.55
49	n-Octane	2.65
50	2,2-Dimethylheptane	0.00
51	2,4-Dimethylheptane	1.18
52	Ethylcyclohexane	6.82
53	2,6-Dimethylheptane	6.14
54	Ethylbenzene	1.43
55	m+p Xylenes	4.54
56	4-Methyloctane	1.18
57	2-Methyloctane	1.33
58	3-Ethylheptane	1.72
59	3-Methyloctane	0.83
60	o-Xylene	1.11
61	1-Nonene	0.82
62	n-Nonane	3.78
I.S.#2	p-Bromofluorobenzene	0.00
63	Isopropylbenzene	0.00
64	3,3,5-Trimethylheptane	2.00
65	2,4,5-Trimethylheptane	2.03
66	n-Propylbenzene	2.83
67	1-Methyl-3-ethylbenzene	1.02
68	1-Methyl-4-ethylbenzene	0.31
69	1,3,5-Trimethylbenzene	4.08
70	3,3,4-Trimethylheptane	1.53

ZymaX FORENSICS

9/22/2011

ZymaX ID	42362-3
Sample ID	LL-FPPH-W11-120810-01

		Relative Area %
71	1-Methyl-2-ethylbenzene	0.64
72	3-Methylnonane	0.00
73	1,2,4-Trimethylbenzene	2.40
74	Isobutylbenzene	0.32
75	sec-Butylbenzene	0.00
76	n-Decane	3.58
77	1,2,3-Trimethylbenzene	1.05
78	Indan	0.72
79	1,3-Diethylbenzene	0.82
80	1,4-Diethylbenzene	0.63
81	n-Butylbenzene	1.04
82	1,3-Dimethyl-5-ethylbenzene	0.49
83	1,4-Dimethyl-2-ethylbenzene	1.00
84	1,3-Dimethyl-4-ethylbenzene	0.61
85	1,2-Dimethyl-4-ethylbenzene	0.67
86	Undecene	0.23
87	1,2,4,5-Tetramethylbenzene	0.30
88	1,2,3,5-Tetramethylbenzene	0.30
89	1,2,3,4-Tetramethylbenzene	0.30
90	Naphthalene	0.17
91	2-Methyl-naphthalene	0.00
92	1-Methyl-naphthalene	0.00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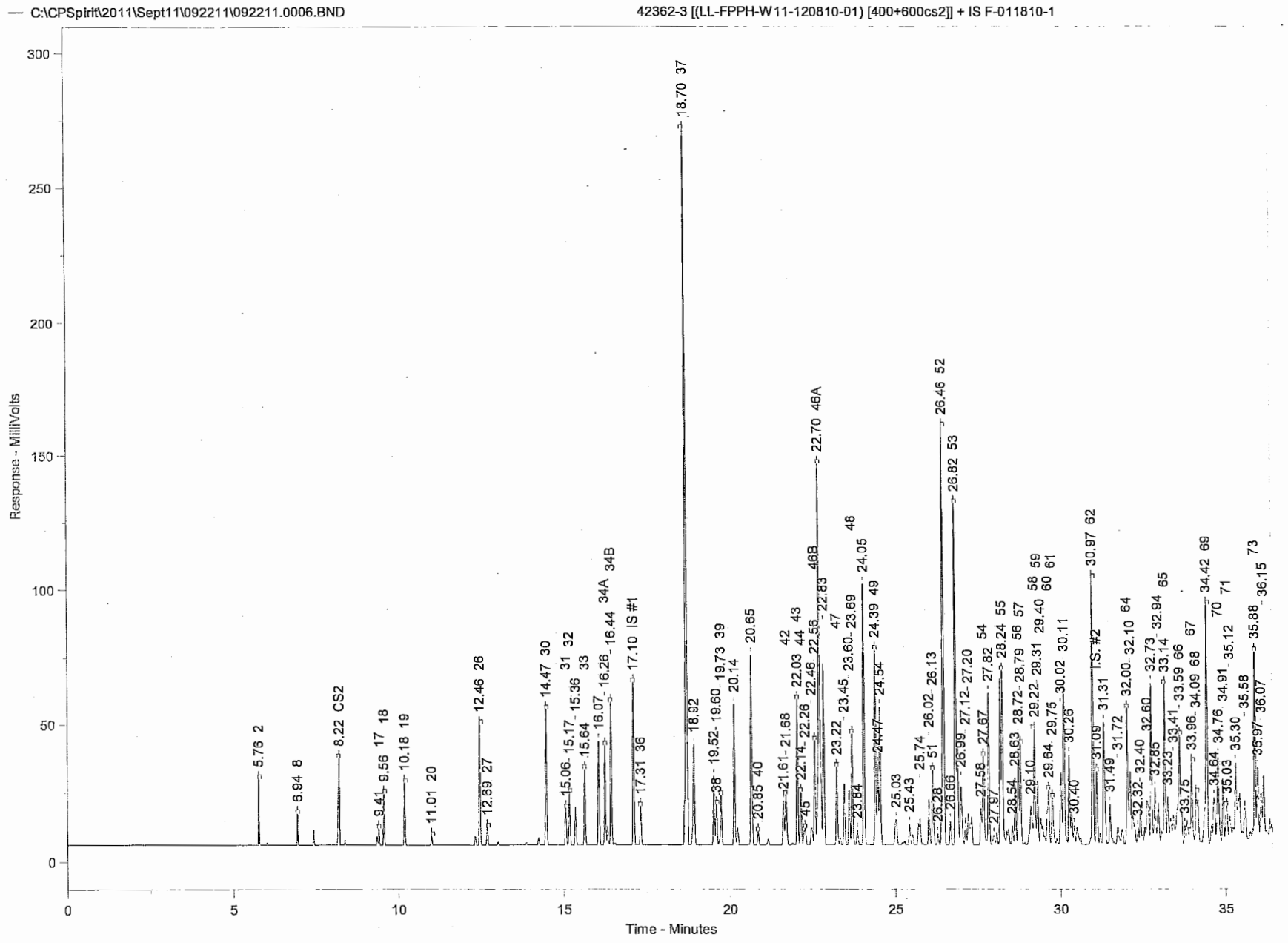
42362-3 [(LL-FPPH-W11-120810-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
CS2
IS #1
IS #2
IS #3
n-C11
n-C12
i-C13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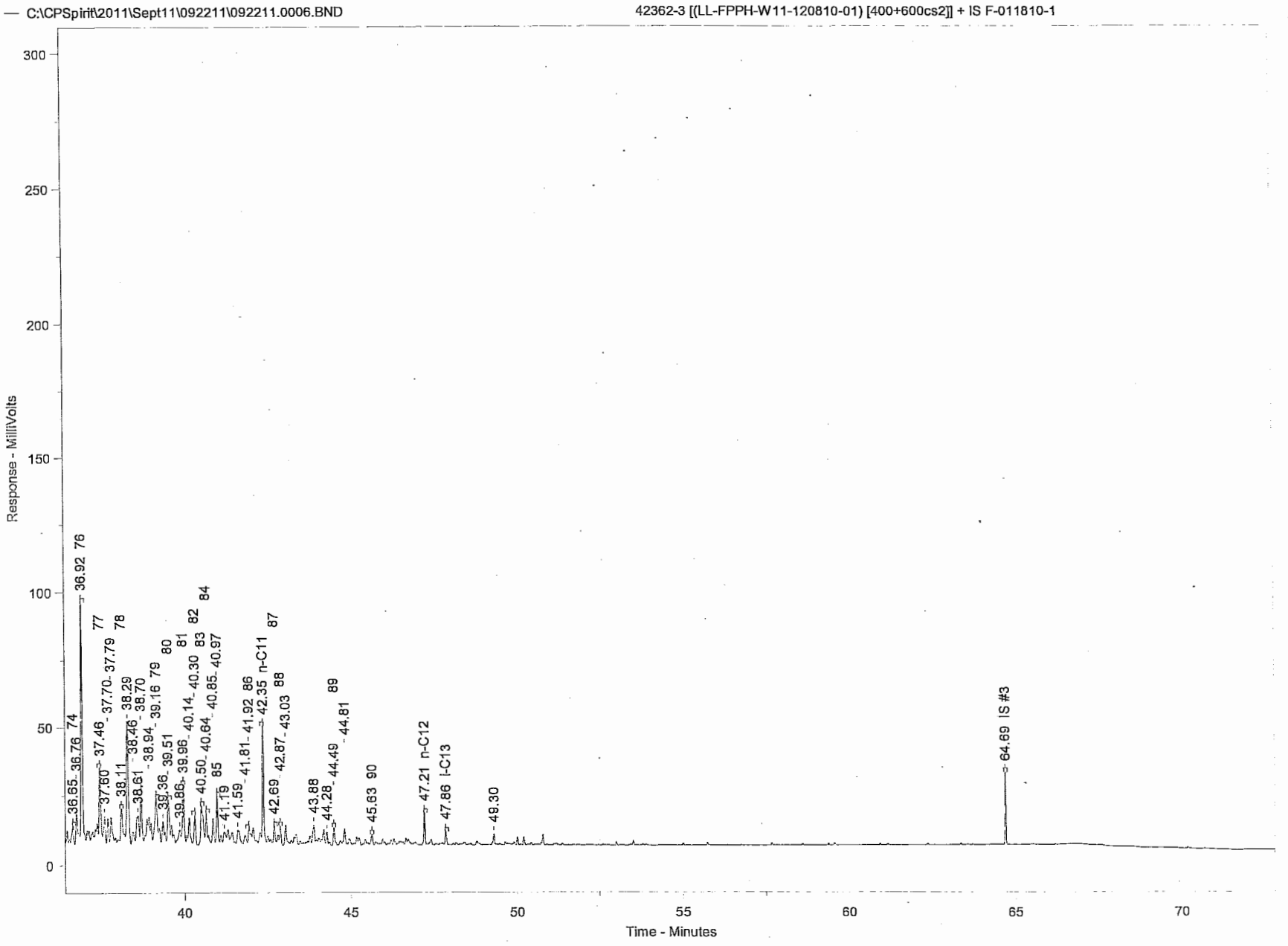
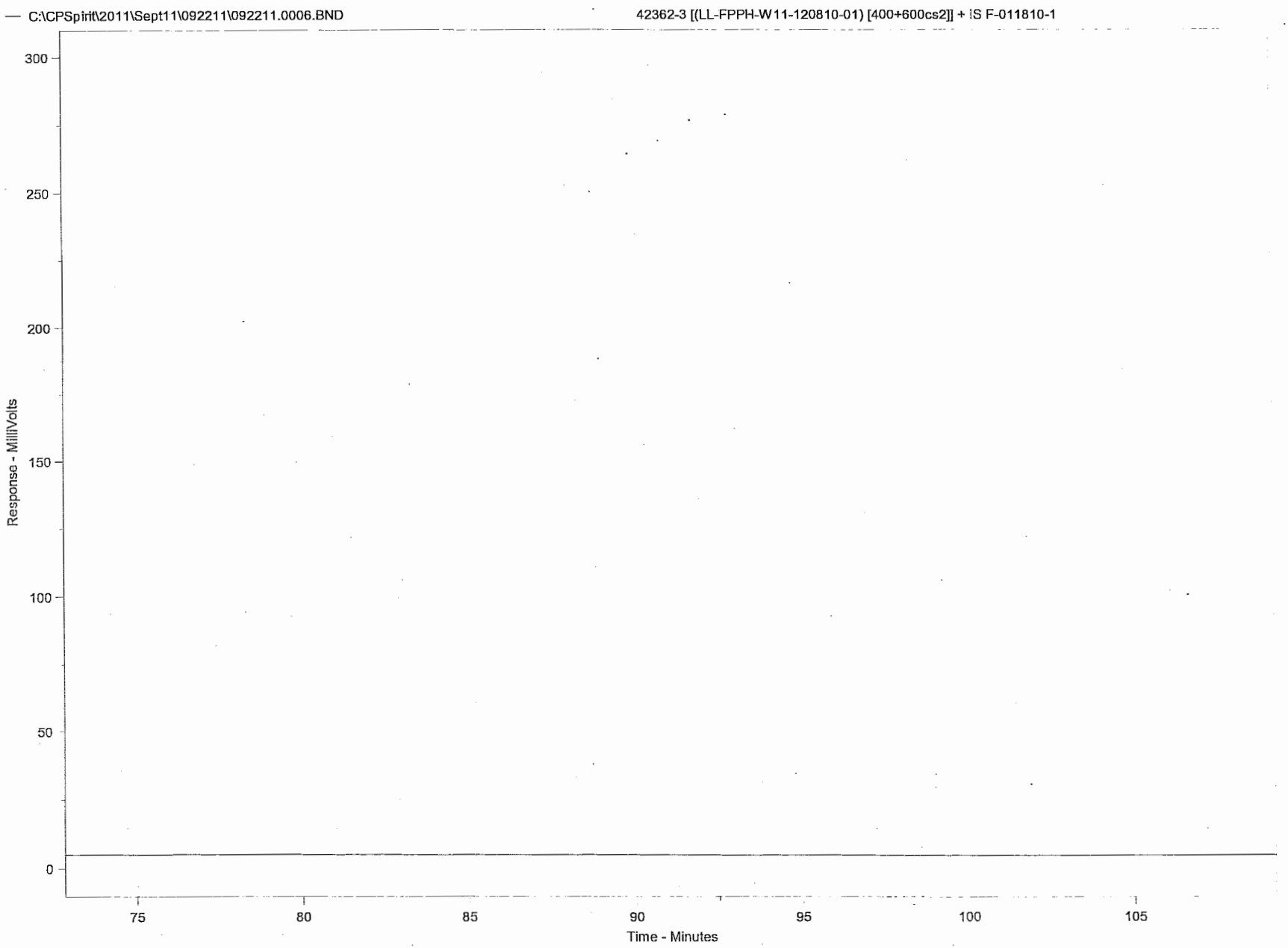
42362-3 [(LL-FPPH-W11-120810-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
0
50
100
150
200
250
300
0
5
10
15
20
25
30
35
5.76 2
6.94 8
8.22 CS2
9.41
9.56 17
10.18 18
11.01 19
12.46 26
12.69 27
14.47 30
15.06
15.17
15.36 31
15.64 32
16.07 33
16.26
16.44 34A
17.10 34B
17.31 IS #1
18.70 37
18.92
19.52
19.60 38
19.73 39
20.14
20.65
20.85 40
21.61
21.68 42
22.03 43
22.14
22.26 44
22.46 45
22.56
22.70 46A
22.83 46B
23.22
23.45
23.60 47
23.69 48
23.84
24.05
24.39 49
24.47
24.54
25.03
25.43
25.74
26.02
26.13
26.28 51
26.46 52
26.66
26.82 53
26.99
27.12
27.20
27.58
27.67
27.82 54
27.97
28.24 55
28.54
28.63
28.72
28.79 56 57
29.10
29.22
29.31
29.40 58 59 60 61
29.64
29.75
30.02
30.11
30.26
30.40
30.97 62
31.09
31.31 I.S. #2
31.49
31.72
32.00
32.10 64
32.32
32.40
32.60
32.65
32.73
32.84 65
33.14
33.23
33.41
33.59 66
33.75
33.96
34.09 67 68
34.42 69
34.64
34.76
34.91
35.03
35.12 70 71
35.30
35.58
35.88
35.97
36.07
36.15 73

Chrom Perfect Chromatogram Report

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42362-3 [(LL-FPPH-W11-120810-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
300
250
200
150
100
50
0
75
80
85
90
95
100
105
Time - Minutes

Sample Name = **42362-3 [(LL-FPPH-W11-120810-01) [400+600cs2]] + IS F-011810-1**

Instrument = Instrument 1
Heading 1 =
Heading 2 =

Acquisition Port = DP#

Raw File Name = **C:\CPSpirit\2011\Sept11\092211\092211.0006.RAW**
Method File Name = C:\CPSpirit\C344.met
Calibration File Name = C:\CPSpirit\081711.cal

Date Taken (end) = 9/23/2011 7:12:45 AM
Method Version = 44
Calibration Version = 5

Peak Name	Ret. Time	Area %	Area
2	5.76	0.2487	29853.24
8	6.94	0.1247	14974.49
CS2	8.22	0.6563	78790.73
17	9.41	0.0800	9608.67
18	9.56	0.2933	35211.61
19	10.18	0.3834	46024.93
20	11.01	0.0566	6800.36
26	12.46	0.8265	99228.39
27	12.69	0.1254	15059.12
30	14.47	1.0013	120215.50
31	15.06	0.2657	31903.85
32	15.17	0.3929	47171.76
	15.36	0.2864	34380.01
33	15.64	0.5683	68233.57
	16.07	0.7803	93676.34
34A	16.26	0.7582	91028.93
34B	16.44	1.0935	131286.20
IS #1	17.10	1.2218	146686.40
36	17.31	0.2869	34440.61
37	18.70	6.0159	722254.40
	18.92	0.9007	108139.00
	19.52	0.5271	63282.82
38	19.60	0.3137	37661.51
39	19.73	0.4201	50440.25
	20.14	1.0956	131533.60
	20.65	1.5290	183573.30
40	20.85	0.1081	12982.84
	21.61	0.3555	42680.71
42	21.68	0.4939	59295.07
43	22.03	1.1458	137566.70
44	22.14	0.4138	49676.08
45	22.26	0.2187	26254.67
	22.46	0.2103	25248.15
46B	22.56	0.8212	98591.06
46A	22.70	4.1360	496557.30
	22.83	1.4389	172755.80
47	23.22	0.6360	76355.34
	23.45	0.4803	57662.38
	23.60	0.4290	51507.35
48	23.69	0.9209	110563.00
	23.84	0.1208	14504.91
	24.05	2.1199	254506.90
49	24.39	1.5698	188469.80
	24.47	0.6465	77614.40
	24.54	1.1576	138974.00
	25.03	0.3239	38881.75
	25.43	0.1663	19963.78
	25.74	0.3687	44266.75
	26.02	0.3682	44199.45
51	26.13	0.6962	83582.34
	26.28	0.0863	10361.58
52	26.46	4.0410	485150.50
	26.66	0.1847	22174.17
53	26.82	3.6355	436473.70
	26.99	0.6068	72849.59

Peak Name	Ret. Time	Area %	Area
	27.12	0.1787	21459.16
	27.20	0.1732	20794.65
	27.58	0.3333	40019.11
54	27.67	0.8461	101579.50
	27.82	1.2659	151985.30
	27.97	0.0885	10620.44
55	28.24	2.6900	322961.20
	28.54	0.1402	16826.70
	28.63	0.5319	63858.35
56	28.72	0.7001	84053.93
57	28.79	0.7881	94621.92
	29.10	0.5754	69079.59
58	29.22	1.0173	122134.80
59	29.31	0.4908	58924.71
	29.40	0.4236	50862.39
60	29.64	0.6588	79088.61
61	29.75	0.4866	58421.91
	30.02	0.7711	92580.40
	30.11	1.4050	168686.10
	30.26	0.7162	85982.36
	30.40	0.1183	14204.59
62	30.97	2.2377	268656.00
I.S. #2	31.09	0.6350	76236.60
	31.31	1.2499	150065.50
	31.49	0.3940	47298.16
	31.72	0.1285	15430.38
64	32.00	1.1862	142408.60
	32.10	0.5456	65505.17
	32.32	0.1102	13235.59
	32.40	0.3410	40935.80
	32.60	0.7017	84249.51
	32.73	1.2988	155932.70
	32.85	0.5012	60167.51
	32.94	0.3566	42814.88
65	33.14	1.2052	144693.10
	33.23	0.2612	31355.94
	33.41	0.1284	15418.00
66	33.59	1.6737	200941.30
	33.75	0.0860	10325.30
67	33.96	0.6065	72809.44
68	34.09	0.1857	22297.62
69	34.42	2.4188	290399.60
	34.64	0.7043	84559.18
70	34.76	0.9070	108894.10
	34.91	0.4603	55261.57
71	35.03	0.3768	45240.54
	35.12	0.1623	19490.09
	35.30	0.4050	48628.28
	35.58	0.3673	44094.27
73	35.88	1.4230	170844.40
	35.97	0.5487	65881.58
	36.07	0.4135	49646.48
	36.15	0.5332	64011.91
74	36.65	0.1889	22674.47
	36.76	0.3662	43963.23
76	36.92	2.1185	254340.70
77	37.46	0.6197	74404.84
	37.60	0.2408	28905.57
	37.70	0.1997	23975.07
	37.79	0.2397	28782.60
78	38.11	0.4272	51283.45
	38.29	1.3457	161558.50
	38.46	0.1504	18060.34
	38.61	0.4211	50558.80
	38.70	0.5499	66017.95
	38.94	0.2174	26102.97
79	39.16	0.4830	57988.12

Peak Name	Ret. Time	Area %	Area
	39.36	0.2470	29656.58
80	39.51	0.3702	44444.45
	39.86	0.1822	21869.24
81	39.96	0.6182	74214.62
	40.14	0.2813	33768.45
82	40.30	0.2904	34867.21
83	40.50	0.5936	71266.19
84	40.64	0.3610	43340.66
	40.85	0.2103	25251.01
85	40.97	0.3982	47812.00
	41.19	0.0885	10623.02
	41.59	0.2127	25536.18
	41.81	0.0984	11818.15
86	41.92	0.1339	16077.04
n-C11	42.35	1.1508	138167.10
87	42.69	0.1806	21687.00
88	42.87	0.1748	20989.04
	43.03	0.2069	24836.91
	43.88	0.1815	21795.90
	44.28	0.0835	10030.64
89	44.49	0.1795	21549.06
	44.81	0.1340	16086.20
90	45.63	0.0995	11951.66
n-C12	47.21	0.2468	29629.79
i-C13	47.86	0.1030	12362.66
	49.30	0.1030	12370.07
IS #3	64.69	0.3962	47570.37

Total Area = 1.200579E+07 Total Height = 4025382 Total Amount = 0

ZymaX FORENSICS

9/22/2011

ZymaX ID	42362-4
Sample ID	LL-FPPH-VE2A-090711-01

Evaporation

n-Pentane / n-Heptane	0.00
2-Methylpentane / 2-Methylheptane	0.00

Waterwashing

Benzene / Cyclohexane	0.00
Toluene / Methylcyclohexane	0.00
Aromatics / Total Paraffins (n+iso+cyc)	36.48
Aromatics / Naphthenes	0.00

Biodegradation

(C4 - C8 Para + Isopara) / C4 - C8 Olefins	0.00
3-Methylhexane / n-Heptane	0.00
Methylcyclohexane / n-Heptane	0.00
Isoparaffins + Naphthenes / Paraffins	0.00

Octane rating

2,2,4,-Trimethylpentane / Methylcyclohexane	0.00

Relative percentages - Bulk hydrocarbon composition as PIANO

% Paraffinic	2.67
% Isoparaffinic	0.00
% Aromatic	97.33
% Naphthenic	0.00
% Olefinic	0.00

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

ZymaX FORENSICS

9/22/2011

ZymaX ID	42362-4
Sample ID	LL-FPPH-VE2A-090711-01

		Relative Area %
1	Propane	0.00
2	Isobutane	0.00
3	Isobutene	0.00
4	Butane/Methanol	0.00
5	trans-2-Butene	0.00
6	cis-2-Butene	0.00
7	3-Methyl-1-butene	0.00
8	Isopentane	0.00
9	1-Pentene	0.00
10	2-Methyl-1-butene	0.00
11	Pentane	0.00
12	trans-2-Pentene	0.00
13	cis-2-Pentene/t-Butanol	0.00
14	2-Methyl-2-butene	0.00
15	2,2-Dimethylbutane	0.00
16	Cyclopentane	0.00
17	2,3-Dimethylbutane/MTBE	0.00
18	2-Methylpentane	0.00
19	3-Methylpentane	0.00
20	Hexane	0.00
21	trans-2-Hexene	0.00
22	3-Methylcyclopentene	0.00
23	3-Methyl-2-pentene	0.00
24	cis-2-Hexene	0.00
25	3-Methyl-trans-2-pentene	0.00
26	Methylcyclopentane	0.00
27	2,4-Dimethylpentane	0.00
28	Benzene	0.00
29	5-Methyl-1-hexene	0.00
30	Cyclohexane	0.00
31	2-Methylhexane/TAME	0.00
32	2,3-Dimethylpentane	0.00
33	3-Methylhexane	0.00
34A	1-trans-3-Dimethylcyclopentane	0.00
34B	1-cis-3-Dimethylcyclopentane	0.00
35	2,2,4-Trimethylpentane	0.00
I.S. #1	à,à,à-Trifluorotoluene	0.00

ZymaX FORENSICS

9/22/2011

ZymaX ID	42362-4
Sample ID	LL-FPPH-VE2A-090711-01

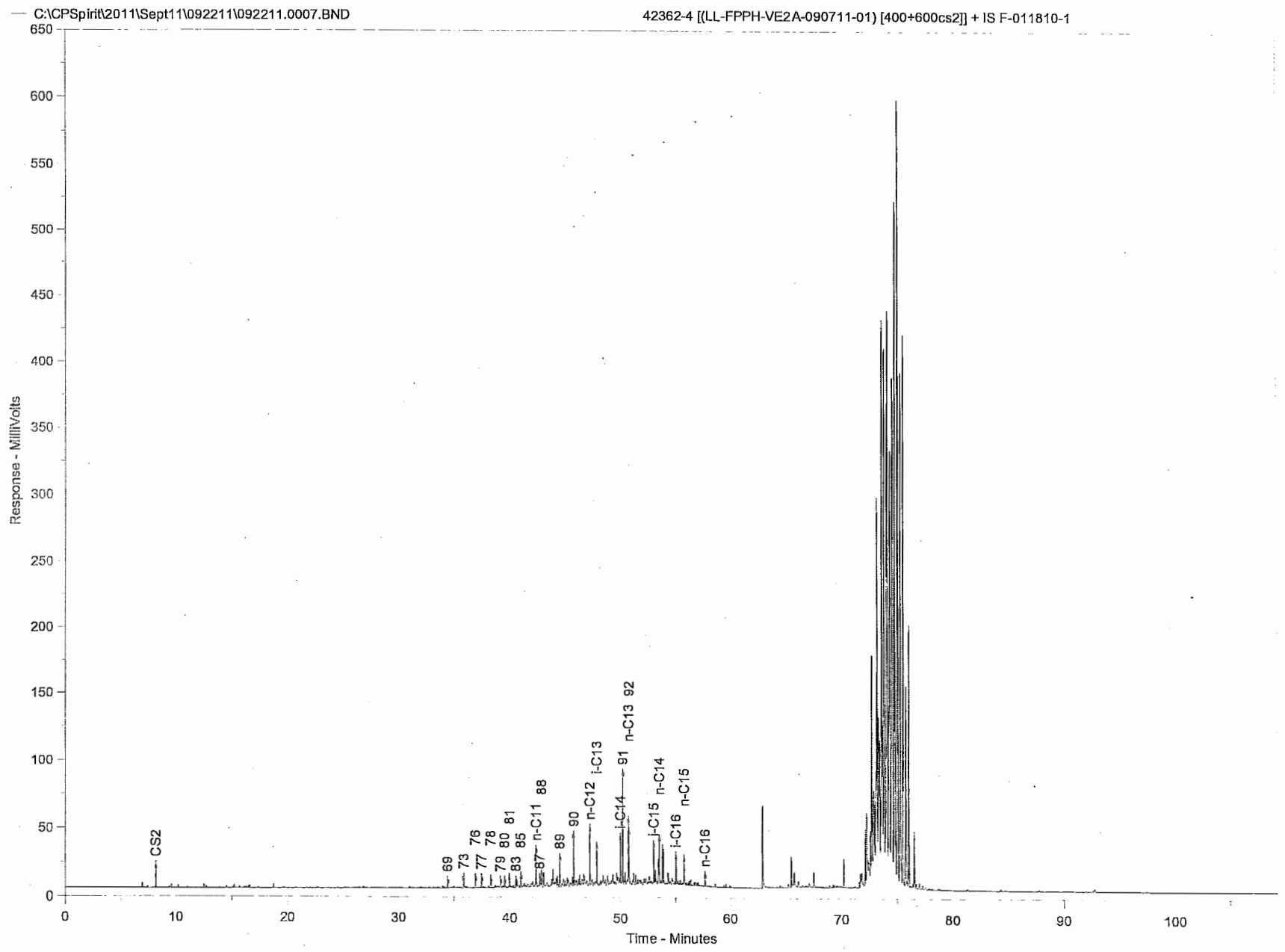
		Relative Area %
36	n-Heptane	0.00
37	Methylcyclohexane	0.00
38	2,5-Dimethylhexane	0.00
39	2,4-Dimethylhexane	0.00
40	2,3,4-Trimethylpentane	0.00
41	Toluene/2,3,3-Trimethylpentane	0.00
42	2,3-Dimethylhexane	0.00
43	2-Methylheptane	0.00
44	4-Methylheptane	0.00
45	3,4-Dimethylhexane	0.00
46A	3-Ethyl-3-methylpentane	0.00
46B	1,4-Dimethylcyclohexane	0.00
47	3-Methylheptane	0.00
48	2,2,5-Trimethylhexane	0.00
49	n-Octane	0.00
50	2,2-Dimethylheptane	0.00
51	2,4-Dimethylheptane	0.00
52	Ethylcyclohexane	0.00
53	2,6-Dimethylheptane	0.00
54	Ethylbenzene	0.00
55	m+p Xylenes	0.00
56	4-Methyloctane	0.00
57	2-Methyloctane	0.00
58	3-Ethylheptane	0.00
59	3-Methyloctane	0.00
60	o-Xylene	0.00
61	1-Nonene	0.00
62	n-Nonane	0.00
I.S.#2	p-Bromofluorobenzene	0.00
63	Isopropylbenzene	0.00
64	3,3,5-Trimethylheptane	0.00
65	2,4,5-Trimethylheptane	0.00
66	n-Propylbenzene	0.00
67	1-Methyl-3-ethylbenzene	0.00
68	1-Methyl-4-ethylbenzene	0.00
69	1,3,5-Trimethylbenzene	1.65
70	3,3,4-Trimethylheptane	0.00

ZymaX FORENSICS

9/22/2011

ZymaX ID 42362-4
Sample ID LL-FPPH-VE2A-090711-01

		Relative Area %
71	1-Methyl-2-ethylbenzene	0.00
72	3-Methylnonane	0.00
73	1,2,4-Trimethylbenzene	2.22
74	Isobutylbenzene	0.00
75	sec-Butylbenzene	0.00
76	n-Decane	2.67
77	1,2,3-Trimethylbenzene	2.41
78	Indan	2.58
79	1,3-Diethylbenzene	1.85
80	1,4-Diethylbenzene	1.89
81	n-Butylbenzene	2.83
82	1,3-Dimethyl-5-ethylbenzene	0.00
83	1,4-Dimethyl-2-ethylbenzene	2.35
84	1,3-Dimethyl-4-ethylbenzene	0.00
85	1,2-Dimethyl-4-ethylbenzene	3.13
86	Undecene	0.00
87	1,2,4,5-Tetramethylbenzene	2.19
88	1,2,3,5-Tetramethylbenzene	3.79
89	1,2,3,4-Tetramethylbenzene	10.66
90	Naphthalene	17.01
91	2-Methyl-naphthalene	30.17
92	1-Methyl-naphthalene	12.60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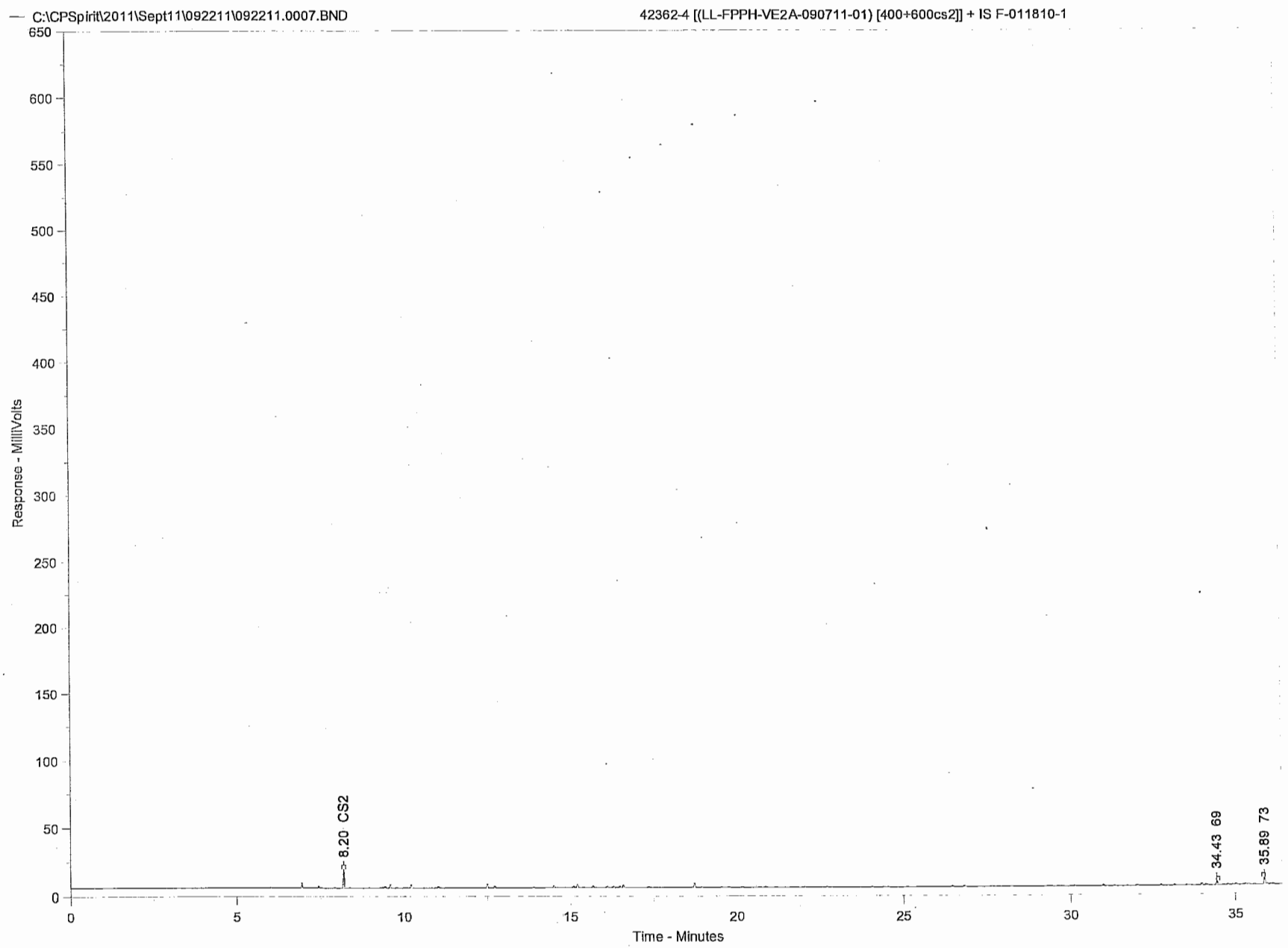
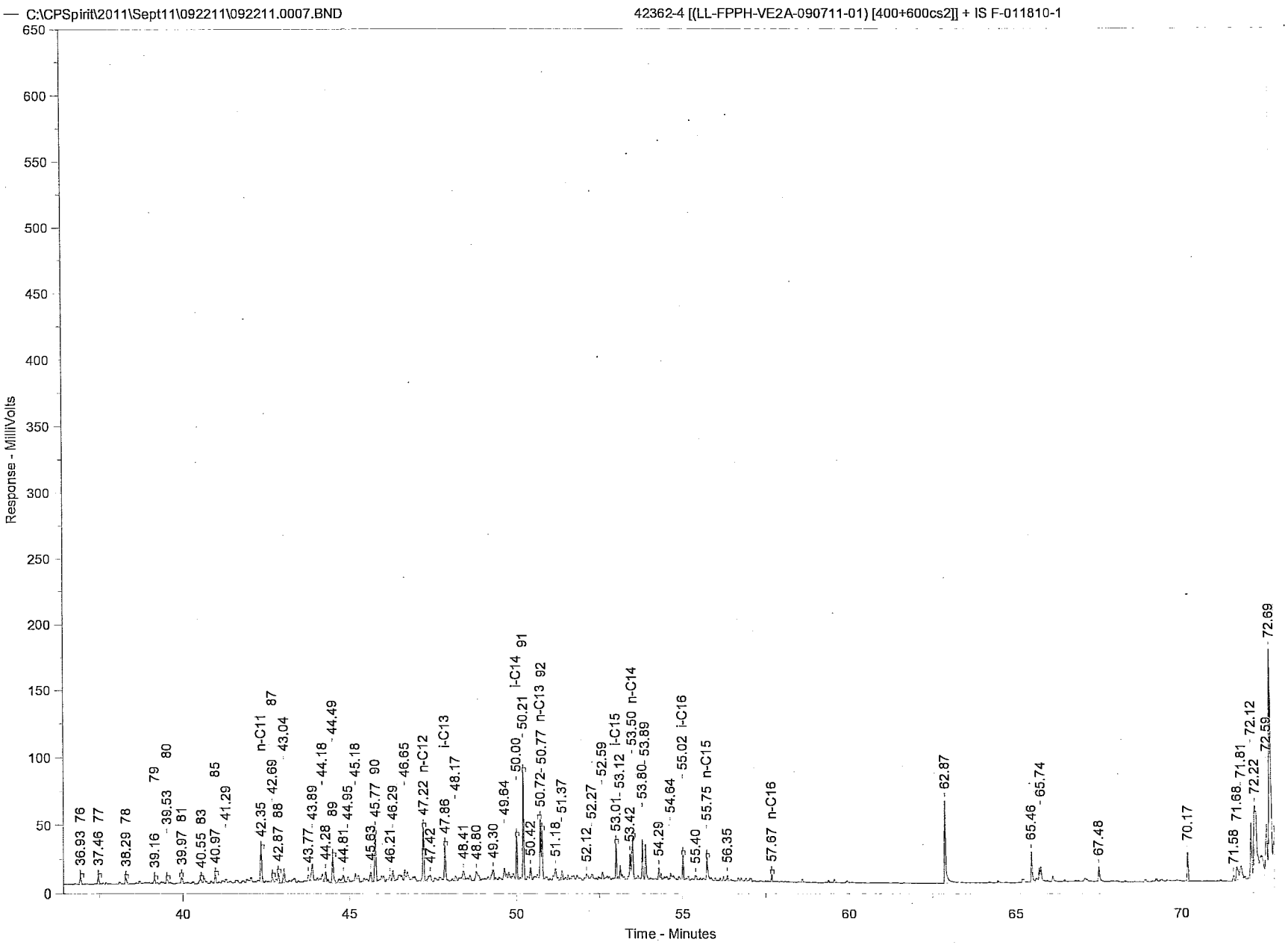
42362-4 [(LL-FPPH-VE2A-090711-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
CS2
69
73
76
77
78
79
80
81
83
85
87
88
n-C11
89
90
n-C12
i-C13
91
n-C13
92
i-C14
i-C15
n-C14
i-C16
n-C15
n-C16


C:\CPSpirit\2011\Sept11\092211\092211.0007.BND
42362-4 [(LL-FPPH-VE2A-090711-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
650
600
550
500
450
400
350
300
250
200
150
100
50
0
8.20 CS2
34.43 69
35.89 73
0
5
10
15
20
25
30
35
Time - Minutes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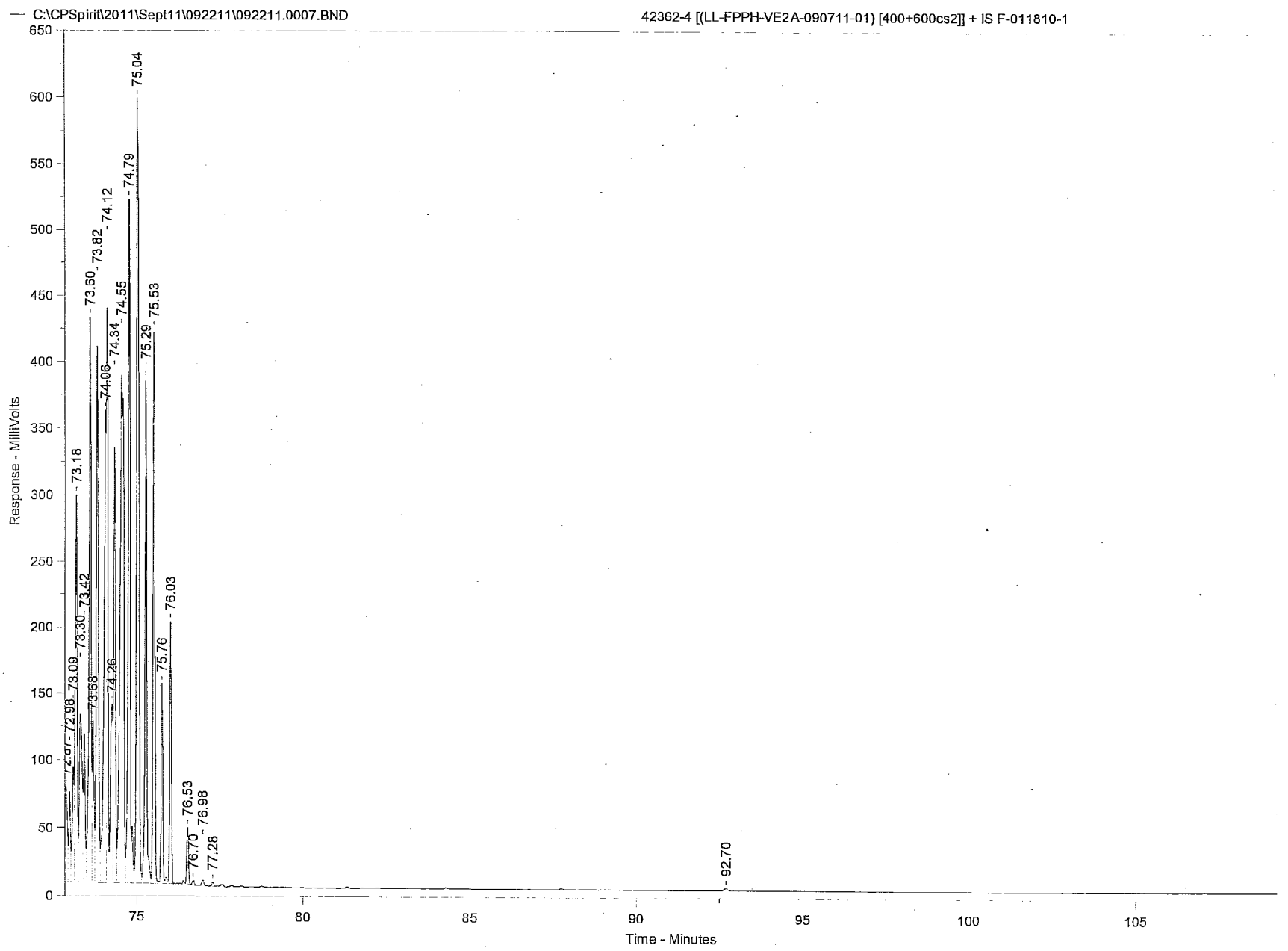
42362-4 [(LL-FPPH-VE2A-090711-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
36.93 76
37.46 77
38.29 78
39.16 79
39.53 80
39.97 81
40.55 83
40.97 85
41.29
42.35 n-C11 87
42.69 88
43.04
43.77 43.89
44.18 89
44.28
44.49
44.81 44.95
45.18
45.63 45.77 90
46.21 46.29
46.65
47.22 n-C12
47.42
47.86 48.17 i-C13
48.41
48.80
49.30
49.64
50.00 50.21 i-C14 91
50.42 50.72 50.77 n-C13 92
51.18 51.37
52.12 52.27
52.59
53.01 53.12 i-C15
53.42 53.50 53.80 53.89 n-C14
54.29
54.64
55.02 i-C16
55.40 55.75 n-C15
56.35
57.67 n-C16
62.87
65.46 65.74
67.48
70.17
71.58 71.68 71.81
72.12
72.22
72.59
72.69


C:\CPSpirit\2011\Sept11\092211\092211.0007.BND
42362-4 [(LL-FPPH-VE2A-090711-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
650
600
550
500
450
400
350
300
250
200
150
100
50
0
75
80
85
90
95
100
105
72.87
72.98
73.09
73.18
73.30
73.42
73.60
73.68
73.82
74.06
74.12
74.26
74.34
74.55
74.79
75.04
75.29
75.53
75.76
76.03
76.53
76.70
76.98
77.28
92.70

Sample Name = **42362-4 [(LL-FPPH-VE2A-090711-01) [400+600cs2]] + IS F-011810-1**

Instrument = Instrument 1
Heading 1 =
Heading 2 =

Acquisition Port = DP#

Raw File Name = **C:\CPSpirit\2011\Sept11\092211\092211.0007.RAW**
Method File Name = C:\CPSpirit\2011\Sept11\092211\092211.0007.BND
Calibration File Name = C:\CPSpirit\2011\Sept11\092211\092211.0007.BND

Date Taken (end) = 9/23/2011 9:24:54 AM
Method Version = 44
Calibration Version = 5

Peak Name	Ret. Time	Area %	Area
CS2	8.20	0.0859	24455.17
69	34.43	0.0319	9067.30
73	35.89	0.0430	12253.05
76	36.93	0.0516	14693.38
77	37.46	0.0467	13284.24
78	38.29	0.0500	14244.03
79	39.16	0.0357	10172.51
80	39.53	0.0365	10402.09
81	39.97	0.0547	15580.82
83	40.55	0.0454	12933.96
85	40.97	0.0605	17210.43
	41.29	0.0554	15779.76
n-C11	42.35	0.2408	68531.67
87	42.69	0.0424	12075.29
88	42.87	0.0734	20883.72
	43.04	0.1212	34496.21
	43.77	0.0402	11452.47
	43.89	0.1487	42334.18
	44.18	0.0452	12853.28
	44.28	0.0633	18020.12
89	44.49	0.2062	58704.90
	44.81	0.1236	35182.37
	44.95	0.0505	14382.42
	45.18	0.0398	11324.61
	45.63	0.0791	22507.78
90	45.77	0.3291	93678.01
	46.21	0.0417	11870.19
	46.29	0.0745	21217.44
	46.65	0.0514	14617.93
n-C12	47.22	0.3621	103065.40
	47.42	0.0999	28432.63
i-C13	47.86	0.2402	68364.09
	48.17	0.0412	11729.16
	48.41	0.0729	20737.87
	48.80	0.1364	38827.90
	49.30	0.1221	34744.51
	49.64	0.0998	28412.94
i-C14	50.00	0.2342	66677.12
91	50.21	0.5837	166158.00
	50.42	0.0718	20440.57
n-C13	50.72	0.3246	92390.27
92	50.77	0.2438	69393.45
	51.18	0.1489	42383.53
	51.37	0.0707	20133.33
	52.12	0.0854	24314.69
	52.27	0.0767	21827.26
	52.59	0.0513	14612.15
i-C15	53.01	0.1856	52841.34
	53.12	0.1145	32579.63
	53.42	0.1540	43831.79
n-C14	53.50	0.3406	96966.34
	53.80	0.2017	57426.14
	53.89	0.1932	55001.81
	54.29	0.0608	17301.20
	54.64	0.0338	9614.84

Peak Name	Ret. Time	Area %	Area
i-C16	55.02	0.1411	40164.08
	55.40	0.0403	11467.93
n-C15	55.75	0.1395	39710.79
	56.35	0.0345	9815.75
n-C16	57.67	0.0392	11150.16
	62.87	0.5682	161742.50
	65.46	0.1879	53473.41
	65.74	0.1775	50515.20
	67.48	0.1168	33233.27
	70.17	0.1679	47799.62
	71.58	0.0401	11411.50
	71.68	0.1471	41862.16
	71.81	0.1548	44070.14
	72.12	0.4179	118944.40
	72.22	1.2309	350366.00
	72.59	0.4929	140316.20
	72.69	2.5248	718679.50
	72.87	1.5169	431801.20
	72.98	0.7612	216684.20
	73.09	1.0912	310627.00
	73.18	4.2748	1216826.00
	73.30	2.6987	768189.10
	73.42	1.4827	422059.70
	73.60	6.1541	1751787.00
	73.68	1.5743	448128.80
	73.82	6.2286	1772993.00
	74.06	5.5295	1573974.00
	74.12	5.0112	1426462.00
	74.26	2.2336	635798.30
	74.34	4.3914	1250022.00
	74.55	10.6483	3031056.00
	74.79	7.1811	2044126.00
	75.04	10.3623	2949663.00
	75.29	5.2663	1499081.00
	75.53	5.3957	1535893.00
	75.76	1.7786	506293.50
	76.03	2.3585	671341.90
	76.53	0.5189	147719.90
	76.70	0.0466	13266.16
	76.98	0.0667	18989.62
	77.28	0.0385	10964.99
	92.70	0.0506	14401.54

Total Area = 2.846529E+07 Total Height = 6828951 Total Amount = 0

ZymaX FORENSICS

9/22/2011

ZymaX ID	42362-5
Sample ID	LL-FPPH-MW708-040611-01

Evaporation

n-Pentane / n-Heptane	0.00
2-Methylpentane / 2-Methylheptane	0.15

Waterwashing

Benzene / Cyclohexane	0.00
Toluene / Methylcyclohexane	0.06
Aromatics / Total Paraffins (n+iso+cyc)	0.69
Aromatics / Naphthenes	2.56

Biodegradation

(C4 - C8 Para + Isopara) / C4 - C8 Olefins	264.98
3-Methylhexane / n-Heptane	0.93
Methylcyclohexane / n-Heptane	5.22
Isoparaffins + Naphthenes / Paraffins	3.70

Octane rating

2,2,4,-Trimethylpentane / Methylcyclohexane	0.21

Relative percentages - Bulk hydrocarbon composition as PIANO

% Paraffinic	12.48
% Isoparaffinic	30.43
% Aromatic	40.20
% Naphthenic	15.72
% Olefinic	1.17

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

ZymaX FORENSICS

9/22/2011

ZymaX ID 42362-5
Sample ID LL-FPPH-MW708-040611-01

		Relative Area %
1	Propane	0.00
2	Isobutane	0.12
3	Isobutene	0.00
4	Butane/Methanol	0.00
5	trans-2-Butene	0.00
6	cis-2-Butene	0.00
7	3-Methyl-1-butene	0.00
8	Isopentane	0.13
9	1-Pentene	0.00
10	2-Methyl-1-butene	0.00
11	Pentane	0.00
12	trans-2-Pentene	0.00
13	cis-2-Pentene/t-Butanol	0.00
14	2-Methyl-2-butene	0.00
15	2,2-Dimethylbutane	0.00
16	Cyclopentane	0.00
17	2,3-Dimethylbutane/MTBE	0.15
18	2-Methylpentane	0.32
19	3-Methylpentane	0.30
20	Hexane	0.18
21	trans-2-Hexene	0.00
22	3-Methylcyclopentene	0.00
23	3-Methyl-2-pentene	0.00
24	cis-2-Hexene	0.00
25	3-Methyl-trans-2-pentene	0.06
26	Methylcyclopentane	0.64
27	2,4-Dimethylpentane	0.39
28	Benzene	0.00
29	5-Methyl-1-hexene	0.07
30	Cyclohexane	0.65
31	2-Methylhexane/TAME	0.59
32	2,3-Dimethylpentane	0.93
33	3-Methylhexane	0.81
34A	1-trans-3-Dimethylcyclopentane	0.50
34B	1-cis-3-Dimethylcyclopentane	0.85
35	2,2,4-Trimethylpentane	0.96
I.S. #1	à,à,à-Trifluorotoluene	0.00

ZymaX FORENSICS

9/22/2011

ZymaX ID 42362-5
Sample ID LL-FPPH-MW708-040611-01

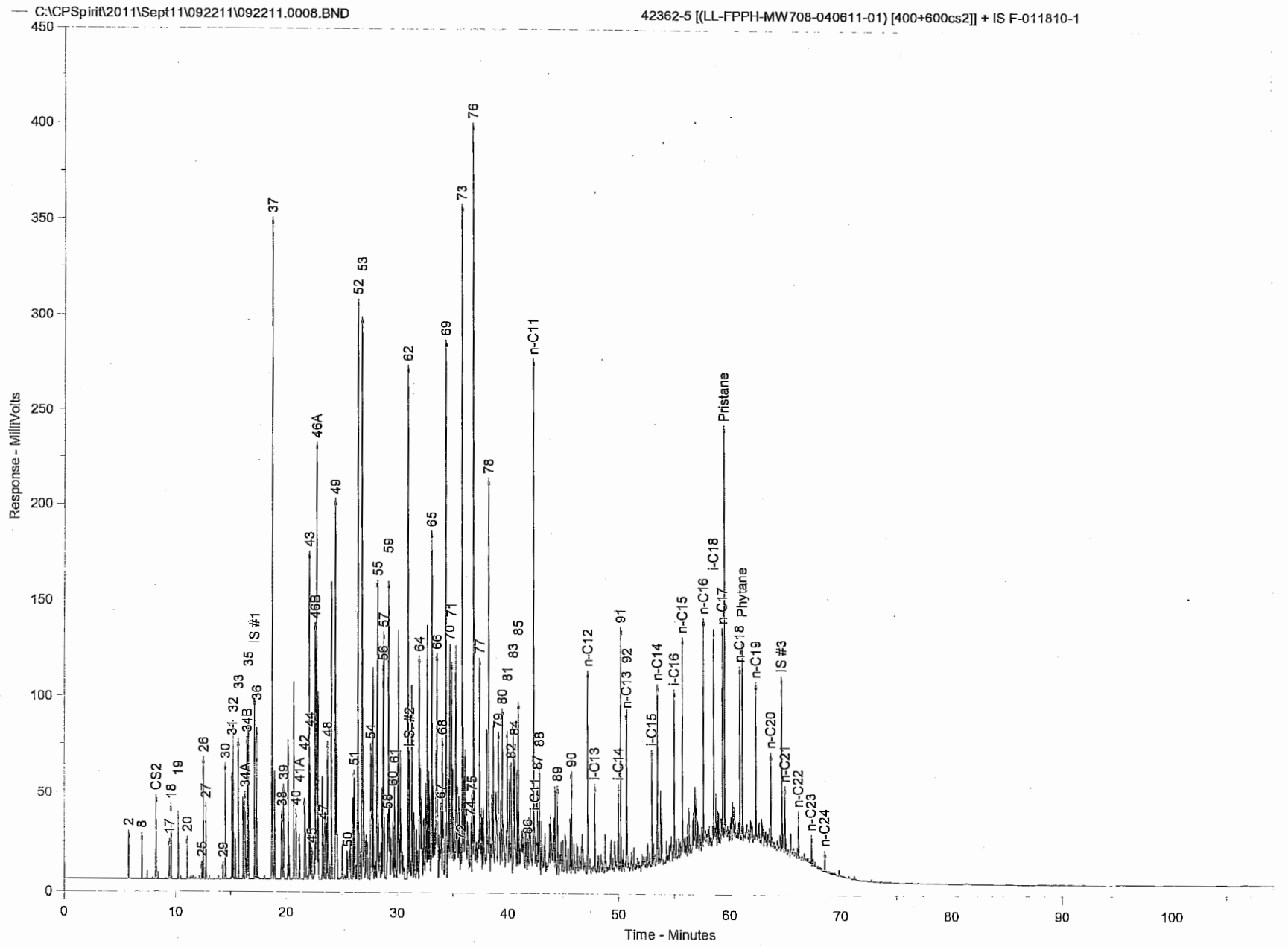
		Relative Area %
36	n-Heptane	0.88
37	Methylcyclohexane	4.58
38	2,5-Dimethylhexane	0.39
39	2,4-Dimethylhexane	0.62
40	2,3,4-Trimethylpentane	0.40
41	Toluene/2,3,3-Trimethylpentane	0.27
42	2,3-Dimethylhexane	0.49
43	2-Methylheptane	2.10
44	4-Methylheptane	0.68
45	3,4-Dimethylhexane	0.26
46A	3-Ethyl-3-methylpentane	1.61
46B	1,4-Dimethylcyclohexane	4.01
47	3-Methylheptane	0.25
48	2,2,5-Trimethylhexane	0.89
49	n-Octane	2.46
50	2,2-Dimethylheptane	0.13
51	2,4-Dimethylheptane	0.80
52	Ethylcyclohexane	4.49
53	2,6-Dimethylheptane	5.04
54	Ethylbenzene	2.04
55	m+p Xylenes	3.23
56	4-Methyloctane	1.39
57	2-Methyloctane	1.53
58	3-Ethylheptane	0.83
59	3-Methyloctane	2.00
60	o-Xylene	0.32
61	1-Nonene	0.76
62	n-Nonane	3.57
I.S.#2	p-Bromofluorobenzene	0.00
63	Isopropylbenzene	0.00
64	3,3,5-Trimethylheptane	1.67
65	2,4,5-Trimethylheptane	2.67
66	n-Propylbenzene	2.32
67	1-Methyl-3-ethylbenzene	0.61
68	1-Methyl-4-ethylbenzene	1.46
69	1,3,5-Trimethylbenzene	4.61
70	3,3,4-Trimethylheptane	1.83

ZymaX FORENSICS

9/22/2011

ZymaX ID 42362-5
Sample ID LL-FPPH-MW708-040611-01

		Relative Area %
71	1-Methyl-2-ethylbenzene	1.55
72	3-Methylnonane	0.15
73	1,2,4-Trimethylbenzene	4.65
74	Isobutylbenzene	0.42
75	sec-Butylbenzene	0.77
76	n-Decane	5.38
77	1,2,3-Trimethylbenzene	1.65
78	Indan	3.22
79	1,3-Diethylbenzene	1.13
80	1,4-Diethylbenzene	1.07
81	n-Butylbenzene	1.31
82	1,3-Dimethyl-5-ethylbenzene	0.82
83	1,4-Dimethyl-2-ethylbenzene	1.78
84	1,3-Dimethyl-4-ethylbenzene	1.08
85	1,2-Dimethyl-4-ethylbenzene	1.23
86	Undecene	0.28
87	1,2,4,5-Tetramethylbenzene	0.54
88	1,2,3,5-Tetramethylbenzene	0.75
89	1,2,3,4-Tetramethylbenzene	0.64
90	Naphthalene	0.69
91	2-Methyl-naphthalene	1.29
92	1-Methyl-naphthalene	0.76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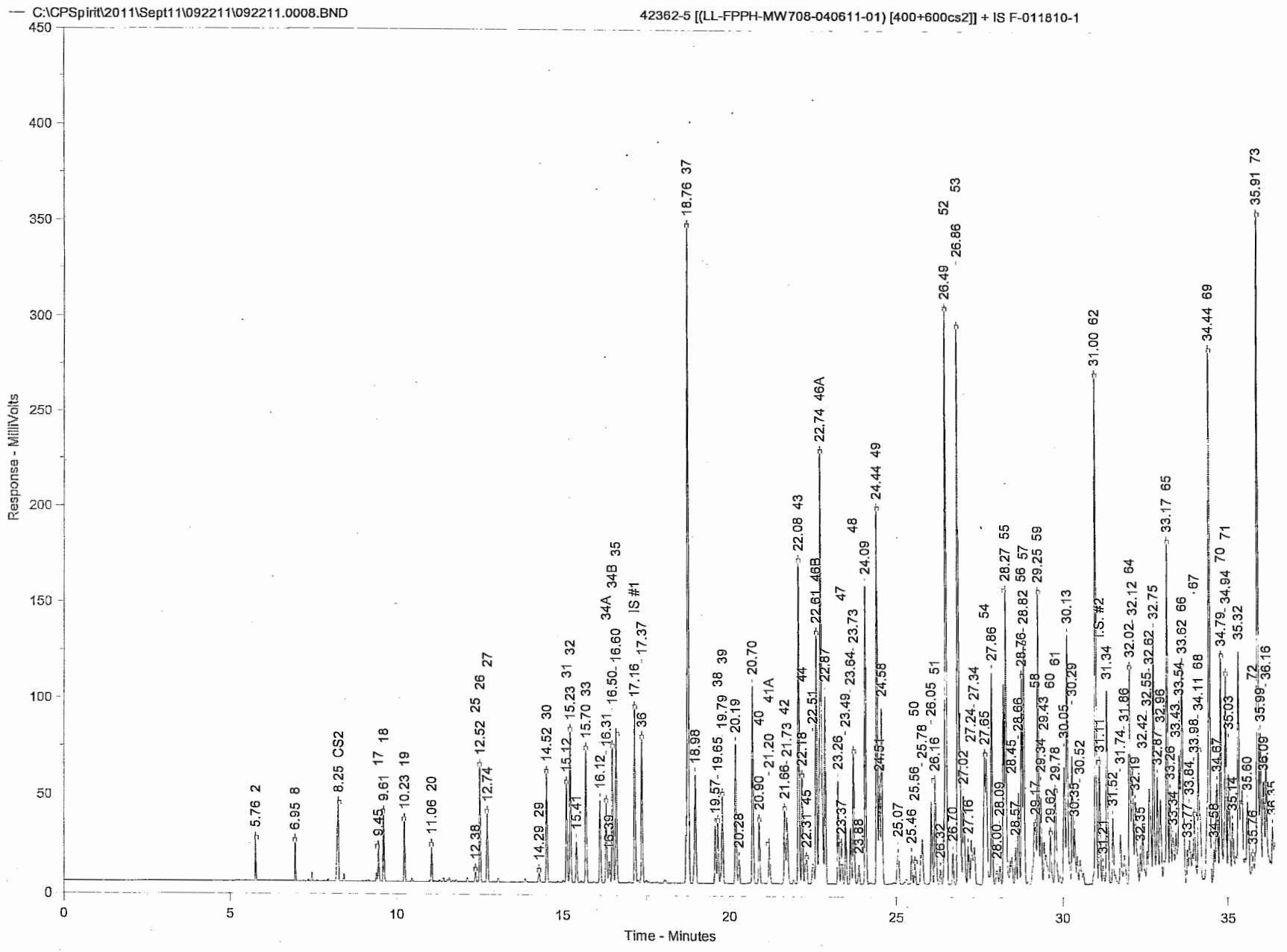
42362-5 [(LL-FPPH-MW708-040611-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
0
50
100
150
200
250
300
350
400
450
0
10
20
30
40
50
60
70
80
90
100
CS2
IS #1
IS #2
IS #3
Pristane
Phytane
n-C11
n-C12
n-C13
n-C14
n-C15
n-C16
n-C17
n-C18
n-C19
n-C20
n-C21
n-C22
n-C23
n-C24
i-C13
i-C14
i-C15
i-C16
i-C18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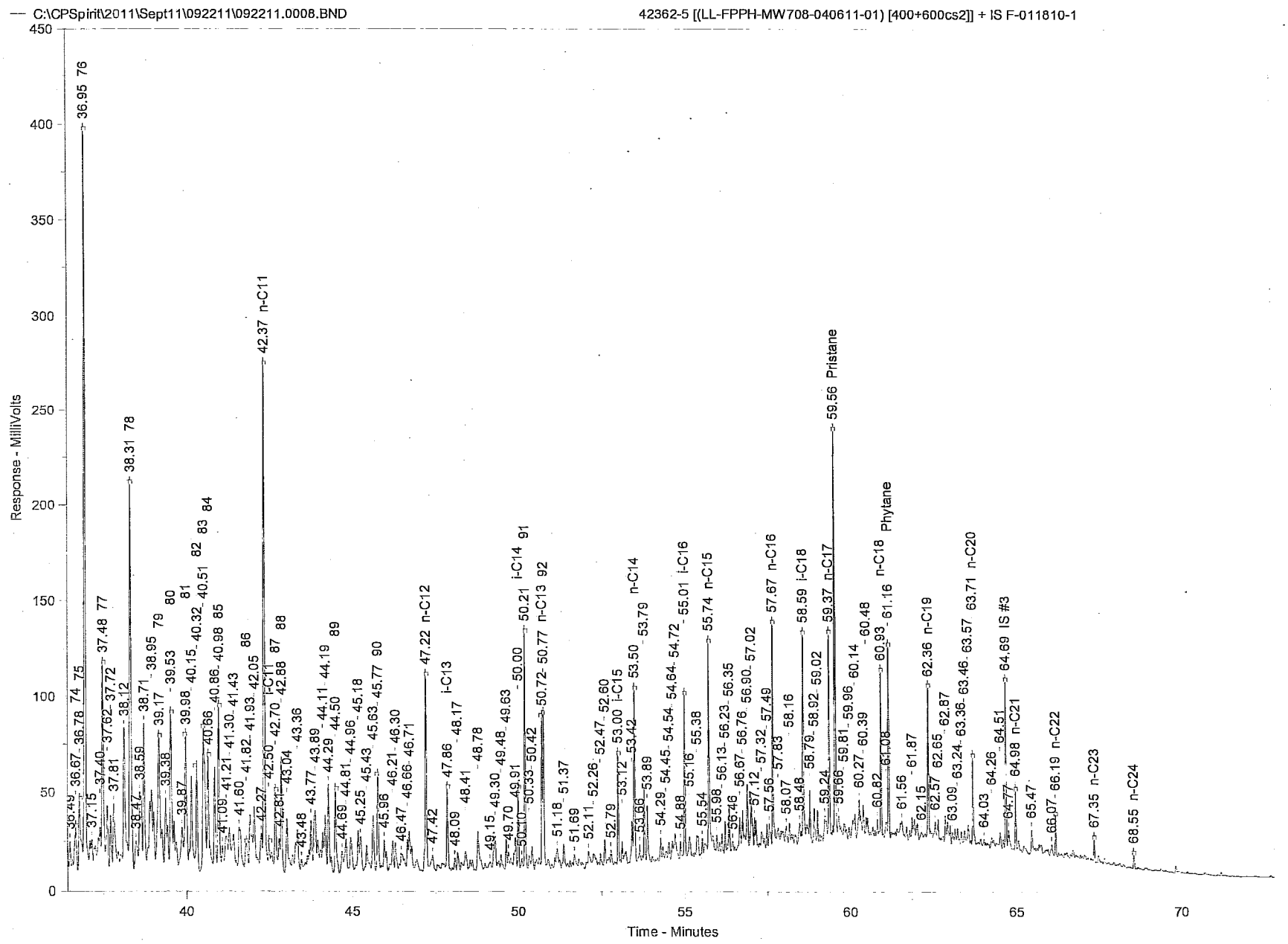
42362-5 [(LL-FPPH-MW708-040611-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
0
50
100
150
200
250
300
350
400
450
0
5
10
15
20
25
30
35
5.76 2
6.95 8
8.25 CS2
9.45
9.61 17
18
10.23 19
11.06 20
12.38
12.52 25
12.74
26
27
14.29 29
14.52 30
15.12
15.23 31
32
15.41
15.70 33
16.12
16.31
16.39
16.50
34A
16.60
34B
35
17.16
17.37
IS #1
18.76 37
36
18.98
19.57
19.65
19.79 38
39
20.19
20.28
20.70
20.90
21.20
40
41A
21.66
21.73
42
22.08 43
22.18
22.31 45
22.51
44
22.61 46B
22.74 46A
22.87
23.26
23.37
23.49
23.64
23.73
47
23.88
24.09
48
24.44 49
24.51
24.58
25.07
25.46
25.56
25.78
50
26.05
26.16
51
26.32
26.49
52
26.70
26.86
53
27.02
27.16
27.24
27.34
54
27.65
27.86
28.00
28.09
28.27 55
28.45
28.57
28.66
28.76
28.82
56
57
29.17
29.25 59
29.34
29.43
60
29.62
29.78
30.05
30.13
30.29
30.35
30.52
31.00 62
31.11
I.S. #2
31.21
31.34
31.52
31.74
31.86
32.02
32.12
64
32.19
32.35
32.42
32.55
32.62
32.75
32.87
32.96
33.17 65
33.26
33.34
33.43
33.54
33.62
66
67
33.77
33.84
33.98
34.11
34.44 69
34.56
34.67
34.79
34.94
70
71
35.03
35.14
35.32
35.60
35.76
35.91 73
35.99
36.09
36.16
72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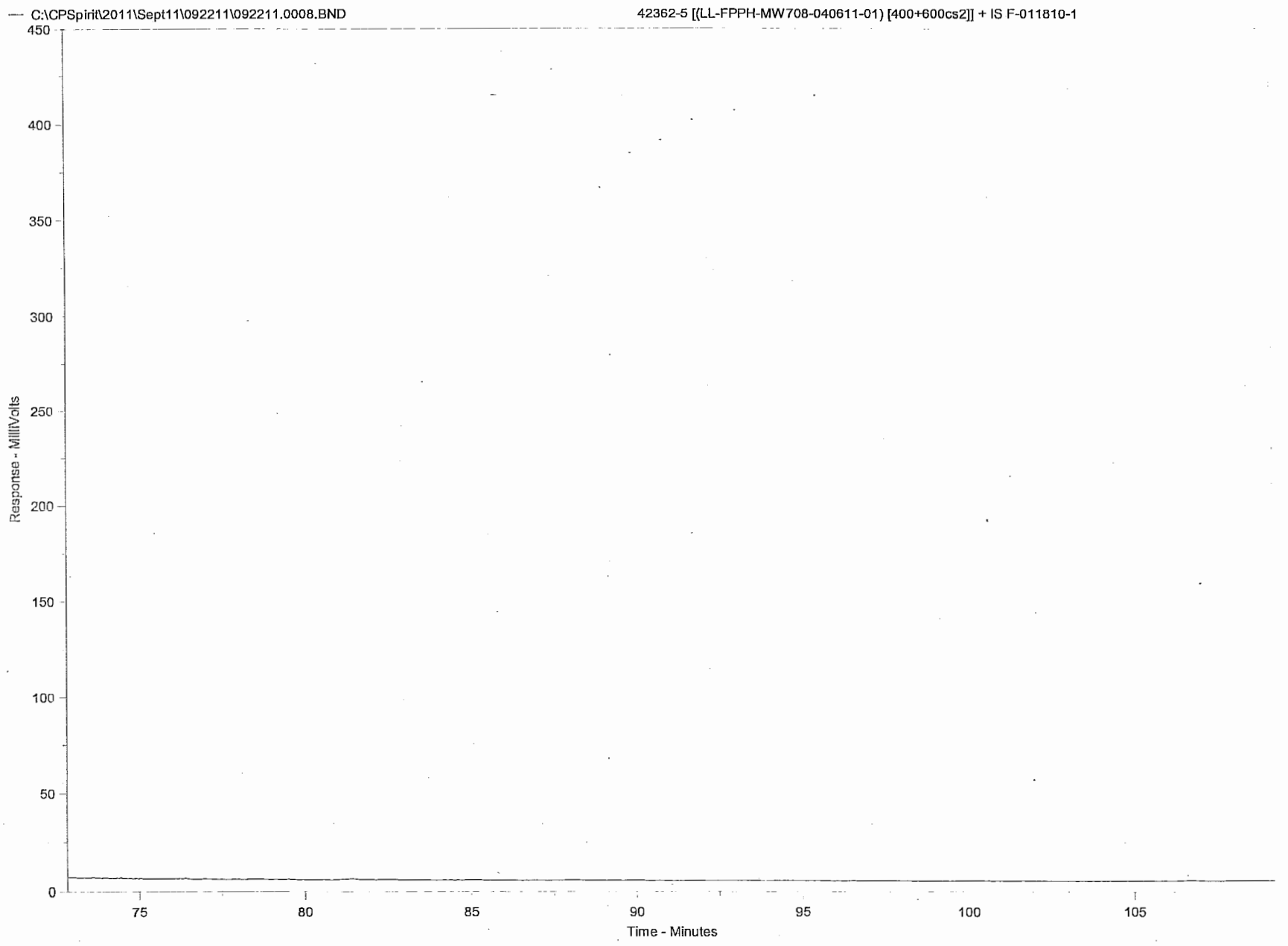
42362-5 [(LL-FPPH-MW708-040611-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
n-C11
n-C12
i-C13
n-C13
i-C14
n-C14
i-C15
n-C15
i-C16
n-C16
i-C18
n-C17
Pristane
n-C18
Phytane
n-C19
n-C20
IS #3
n-C21
n-C22
n-C23
n-C24


C:\CPSpirit\2011\Sept11\092211\092211.0008.BND
42362-5 [(LL-FPPH-MW708-040611-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
450
400
350
300
250
200
150
100
50
0
75
80
85
90
95
100
105
Time - Minutes

Sample Name = **42362-5 [(LL-FPPH-MW708-040611-01) [400+600cs2]] + IS F-011810-1**

Instrument = Instrument 1
Heading 1 =
Heading 2 =

Acquisition Port = DP#

Raw File Name = **C:\CPSpirit\2011\Sept11\092211\092211.0008.RAW**
Method File Name = C:\CPSpirit\2011\Sept11\092211\092211.0008.BND
Calibration File Name = C:\CPSpirit\2011\Sept11\092211\092211.0008.BND

Date Taken (end) = 9/23/2011 11:37:30 AM
Method Version = 44
Calibration Version = 5

Peak Name	Ret. Time	Area %	Area
2	5.76	0.0614	25588.80
8	6.95	0.0618	25750.96
CS2	8.25	0.2773	115482.30
17	9.45	0.0726	30248.15
18	9.61	0.1596	66449.77
19	10.23	0.1485	61842.82
20	11.06	0.0899	37443.96
25	12.38	0.0295	12303.68
26	12.52	0.3162	131679.10
27	12.74	0.1942	80868.14
29	14.29	0.0336	13978.89
30	14.52	0.3220	134101.00
31	15.12	0.2909	121127.10
32	15.23	0.4602	191647.30
	15.41	0.1252	52153.84
33	15.70	0.4012	167100.00
	16.12	0.2479	103228.50
34A	16.31	0.2445	101830.00
	16.39	0.0645	26877.96
34B	16.50	0.4180	174092.40
35	16.60	0.4722	196654.70
IS #1	17.16	0.5208	216868.70
36	17.37	0.4321	179935.20
37	18.76	2.2566	939765.30
	18.98	0.4056	168920.20
	19.57	0.1795	74751.52
38	19.65	0.1910	79529.22
39	19.79	0.3043	126727.60
	20.19	0.4476	186411.80
	20.28	0.0768	31980.35
	20.70	0.6319	263159.80
40	20.90	0.1973	82167.47
41A	21.20	0.1323	55086.24
42	21.66	0.2409	100333.80
	21.73	0.2713	112994.60
43	22.08	1.0328	430100.70
44	22.18	0.3347	139383.00
45	22.31	0.1297	54008.12
	22.51	0.1020	42492.05
46B	22.61	0.7932	330313.00
46A	22.74	1.9738	821997.40
	22.87	0.5914	246298.10
	23.26	0.3379	140726.80
47	23.37	0.1249	52022.69
	23.49	0.2016	83953.27
	23.64	0.1817	75684.96
48	23.73	0.4360	181591.50
	23.88	0.0663	27616.84
	24.09	0.9793	407831.60
49	24.44	1.2125	504930.70
	24.51	0.3262	135843.50
	24.58	0.5948	247713.90
	25.07	0.1679	69934.70
	25.46	0.0964	40134.54
50	25.56	0.0661	27534.29

Peak Name	Ret. Time	Area %	Area
	25.78	0.2427	101076.70
	26.05	0.2787	116064.20
51	26.16	0.3933	163776.90
	26.32	0.0483	20115.14
52	26.49	2.2120	921200.40
	26.70	0.1062	44236.40
53	26.86	2.4808	1033138.00
	27.02	0.4048	168563.10
	27.16	0.1269	52862.48
	27.24	0.2094	87218.49
	27.34	0.1473	61338.86
54	27.65	1.0028	417632.90
	27.86	0.7028	292686.10
	28.00	0.0685	28508.35
	28.09	0.0580	24164.17
55	28.27	1.5920	662973.10
	28.45	0.1288	53646.98
	28.57	0.1162	48409.34
	28.66	0.3013	125489.40
56	28.76	0.6839	284824.90
57	28.82	0.7513	312900.00
58	29.17	0.4073	169614.00
59	29.25	0.9842	409868.00
	29.34	0.2824	117615.50
	29.43	0.0714	29729.70
60	29.62	0.1555	64770.04
61	29.78	0.3746	156010.60
	30.05	0.4968	206878.70
	30.13	0.9006	375051.20
	30.29	0.3873	161305.50
	30.35	0.1317	54830.39
	30.52	0.0709	29521.49
62	31.00	1.7604	733103.20
I.S. #2	31.11	0.4350	181161.00
	31.21	0.0691	28759.92
	31.34	0.8243	343267.80
	31.52	0.2632	109604.70
	31.74	0.1966	81868.65
	31.86	0.1426	59395.99
64	32.02	0.8212	341979.30
	32.12	0.4951	206202.80
	32.19	0.4068	169424.50
	32.35	0.1060	44152.96
	32.42	0.2523	105089.60
	32.55	0.1152	47965.13
	32.62	0.5399	224836.30
	32.75	0.8661	360707.30
	32.87	0.4381	182430.00
	32.96	0.3483	145061.70
65	33.17	1.3171	548486.40
	33.26	0.3391	141216.00
	33.34	0.2318	96544.40
	33.43	0.2073	86334.38
	33.54	0.5680	236563.50
66	33.62	1.1442	476499.30
	33.77	0.1132	47125.32
	33.84	0.2060	85786.75
67	33.98	0.2985	124312.90
68	34.11	0.7211	300285.50
69	34.44	2.2683	944626.70
	34.58	0.1190	49551.67
	34.67	0.4622	192489.10
70	34.79	0.9013	375351.00
71	34.94	0.7622	317425.10
	35.03	0.4165	173442.20
	35.14	0.1548	64469.75
	35.32	0.5617	233929.60

Peak Name	Ret. Time	Area %	Area
	35.60	0.3131	130402.70
72	35.76	0.0751	31271.61
73	35.91	2.2887	953115.90
	35.99	0.5084	211709.80
	36.09	0.4132	172095.50
	36.16	0.5762	239969.80
	36.35	0.2694	112189.00
	36.49	0.1135	47278.60
74	36.67	0.2072	86306.91
75	36.78	0.3811	158699.00
76	36.95	2.6512	1104092.00
	37.15	0.1952	81294.39
	37.40	0.2676	111423.30
77	37.48	0.8120	338149.30
	37.62	0.2603	108397.20
	37.72	0.1664	69286.51
	37.81	0.2503	104232.40
	38.12	0.6106	254268.90
78	38.31	1.5858	660404.70
	38.47	0.1596	66461.09
	38.59	0.4751	197869.60
	38.71	0.4913	204583.10
	38.95	0.3152	131284.30
79	39.17	0.5573	232085.30
	39.38	0.3348	139420.00
80	39.53	0.5256	218872.40
	39.87	0.2083	86753.96
81	39.98	0.6466	269260.70
	40.15	0.3920	163247.70
82	40.32	0.4038	168160.70
83	40.51	0.8750	364376.20
84	40.66	0.5343	222494.00
	40.86	0.3811	158722.70
85	40.98	0.6049	251890.90
	41.09	0.0953	39675.71
	41.21	0.2160	89966.37
	41.30	0.2049	85310.70
	41.43	0.2267	94427.35
	41.60	0.2640	109939.40
86	41.82	0.1365	56833.35
	41.93	0.2961	123331.80
	42.05	0.2637	109836.20
	42.27	0.1294	53887.35
n-C11	42.37	1.7707	737422.90
i-C11	42.50	0.0485	20188.25
87	42.70	0.2639	109905.70
	42.81	0.1142	47541.93
88	42.88	0.3713	154643.70
	43.04	0.2798	116526.30
	43.36	0.2679	111567.10
	43.48	0.0260	10833.38
	43.77	0.1829	76172.22
	43.89	0.2319	96589.99
	44.11	0.0865	36028.57
	44.19	0.1680	69954.99
	44.29	0.3031	126215.10
89	44.50	0.3128	130271.60
	44.69	0.1011	42087.66
	44.81	0.1908	79452.13
	44.96	0.1830	76199.95
	45.18	0.1587	66070.56
	45.25	0.1644	68458.37
	45.43	0.1558	64869.51
	45.63	0.2485	103508.40
90	45.77	0.3412	142109.30
	45.96	0.1694	70550.80
	46.21	0.0819	34089.77

Peak Name	Ret. Time	Area %	Area
	46.30	0.0872	36303.01
	46.47	0.0890	37075.04
	46.66	0.0828	34487.42
	46.71	0.1937	80678.42
n-C12	47.22	0.6708	279366.50
	47.42	0.1082	45080.68
i-C13	47.86	0.2561	106656.60
	48.09	0.0360	14973.70
	48.17	0.0644	26810.08
	48.41	0.0749	31179.14
	48.78	0.2103	87595.67
	49.15	0.0451	18790.14
	49.30	0.2258	94020.75
	49.48	0.0545	22692.35
	49.63	0.0784	32667.63
	49.70	0.0330	13725.38
	49.91	0.1172	48798.77
i-C14	50.00	0.1991	82930.86
	50.10	0.0310	12895.00
91	50.21	0.6360	264863.80
	50.33	0.0502	20895.40
	50.42	0.0769	32031.21
n-C13	50.72	0.3793	157964.80
92	50.77	0.3742	155829.90
	51.18	0.1442	60069.06
	51.37	0.0646	26904.73
	51.69	0.0415	17277.37
	52.11	0.1194	49731.15
	52.26	0.1021	42530.68
	52.47	0.0397	16529.18
	52.60	0.0682	28419.07
	52.79	0.0356	14820.64
i-C15	53.00	0.2748	114439.40
	53.12	0.1309	54501.57
	53.42	0.1329	55358.48
n-C14	53.50	0.5098	212311.40
	53.66	0.0636	26505.64
	53.79	0.1815	75568.55
	53.89	0.1649	68684.90
	54.29	0.0684	28464.82
	54.45	0.0365	15214.09
	54.54	0.0689	28684.69
	54.64	0.0687	28620.71
	54.72	0.1423	59276.01
	54.88	0.0567	23616.09
i-C16	55.01	0.4600	191584.00
	55.16	0.1018	42383.39
	55.38	0.1149	47854.72
	55.54	0.0547	22766.12
n-C15	55.74	0.6232	259539.70
	55.98	0.0624	26005.42
	56.13	0.0584	24326.76
	56.23	0.0735	30614.92
	56.35	0.1393	58027.78
	56.46	0.0450	18756.49
	56.67	0.1250	52045.23
	56.76	0.1749	72843.01
	56.90	0.2179	90751.62
	57.02	0.2327	96892.73
	57.12	0.1400	58311.79
	57.32	0.0476	19819.78
	57.49	0.0507	21103.82
	57.56	0.0910	37892.96
n-C16	57.67	0.5337	222260.40
	57.83	0.0538	22422.61
	58.07	0.0580	24169.54
	58.16	0.0415	17280.04

Peak Name	Ret. Time	Area %	Area
	58.48	0.1143	47613.26
i-C18	58.59	0.6010	250306.40
	58.79	0.1393	57999.03
	58.92	0.1061	44204.73
	59.02	0.0707	29451.21
	59.24	0.1489	62025.50
n-C17	59.37	0.5785	240913.70
Pristane	59.56	1.1294	470348.90
	59.66	0.1626	67730.01
	59.81	0.0714	29737.96
	59.96	0.0361	15015.12
	60.14	0.1755	73078.97
	60.27	0.2354	98023.17
	60.39	0.1097	45700.88
	60.48	0.1369	57031.45
	60.82	0.0558	23238.86
n-C18	60.93	0.4079	169855.10
	61.08	0.0653	27213.18
Phytane	61.16	0.5047	210196.10
	61.56	0.0725	30174.60
	61.87	0.0259	10805.02
	62.15	0.0423	17629.44
n-C19	62.36	0.4573	190425.60
	62.57	0.0781	32511.25
	62.65	0.0561	23364.71
	62.87	0.0519	21629.25
	63.09	0.0461	19208.58
	63.24	0.0574	23885.60
	63.36	0.0288	11981.60
	63.46	0.0548	22803.45
	63.57	0.0757	31518.77
n-C20	63.71	0.2078	86554.98
	64.03	0.0226	9424.49
	64.26	0.1061	44169.79
	64.51	0.0540	22508.67
IS #3	64.69	0.3888	161904.90
	64.77	0.0895	37273.84
n-C21	64.98	0.1281	53357.63
	65.47	0.0698	29053.11
	66.07	0.0498	20757.13
n-C22	66.19	0.0880	36656.94
n-C23	67.35	0.0488	20332.38
n-C24	68.55	0.0355	14776.12

Total Area = 4.164508E+07 Total Height = 1.373656E+07 Total Amount = 1

ZymaX FORENSICS

9/22/2011

ZymaX ID	42362-6
Sample ID	LL-FPPH-W15A-091411-01

Evaporation

n-Pentane / n-Heptane	0.21
2-Methylpentane / 2-Methylheptane	0.73

Waterwashing

Benzene / Cyclohexane	0.15
Toluene / Methylcyclohexane	0.19
Aromatics / Total Paraffins (n+iso+cyc)	0.48
Aromatics / Naphthenes	1.54

Biodegradation

(C4 - C8 Para + Isopara) / C4 - C8 Olefins	52.96
3-Methylhexane / n-Heptane	0.72
Methylcyclohexane / n-Heptane	2.37
Isoparaffins + Naphthenes / Paraffins	3.82

Octane rating

2,2,4,-Trimethylpentane / Methylcyclohexane	0.23

Relative percentages - Bulk hydrocarbon composition as PIANO

% Paraffinic	13.83
% Isoparaffinic	32.07
% Aromatic	32.01
% Naphthenic	20.82
% Olefinic	1.26

Submitted by,
Zymax Forensics, a DPRA Company

Shan-Tan Lu, Ph.D.
Director of Forensic Geochemistry

ZymaX FORENSICS

9/22/2011

ZymaX ID	42362-6
Sample ID	LL-FPPH-W15A-091411-01

		Relative Area %
1	Propane	0.00
2	Isobutane	0.09
3	Isobutene	0.00
4	Butane/Methanol	0.03
5	trans-2-Butene	0.00
6	cis-2-Butene	0.00
7	3-Methyl-1-butene	0.00
8	Isopentane	0.59
9	1-Pentene	0.00
10	2-Methyl-1-butene	0.04
11	Pentane	0.65
12	trans-2-Pentene	0.07
13	cis-2-Pentene/t-Butanol	0.04
14	2-Methyl-2-butene	0.12
15	2,2-Dimethylbutane	0.07
16	Cyclopentane	0.00
17	2,3-Dimethylbutane/MTBE	0.44
18	2-Methylpentane	1.71
19	3-Methylpentane	1.33
20	Hexane	1.97
21	trans-2-Hexene	0.13
22	3-Methylcyclopentene	0.00
23	3-Methyl-2-pentene	0.00
24	cis-2-Hexene	0.13
25	3-Methyl-trans-2-pentene	0.12
26	Methylcyclopentane	3.04
27	2,4-Dimethylpentane	0.88
28	Benzene	0.32
29	5-Methyl-1-hexene	0.13
30	Cyclohexane	2.12
31	2-Methylhexane/TAME	1.80
32	2,3-Dimethylpentane	1.96
33	3-Methylhexane	2.21
34A	1-trans-3-Dimethylcyclopentane	1.46
34B	1-cis-3-Dimethylcyclopentane	2.19
35	2,2,4-Trimethylpentane	1.64
I.S. #1	à,à,à-Trifluorotoluene	0.00

ZymaX FORENSICS

9/22/2011

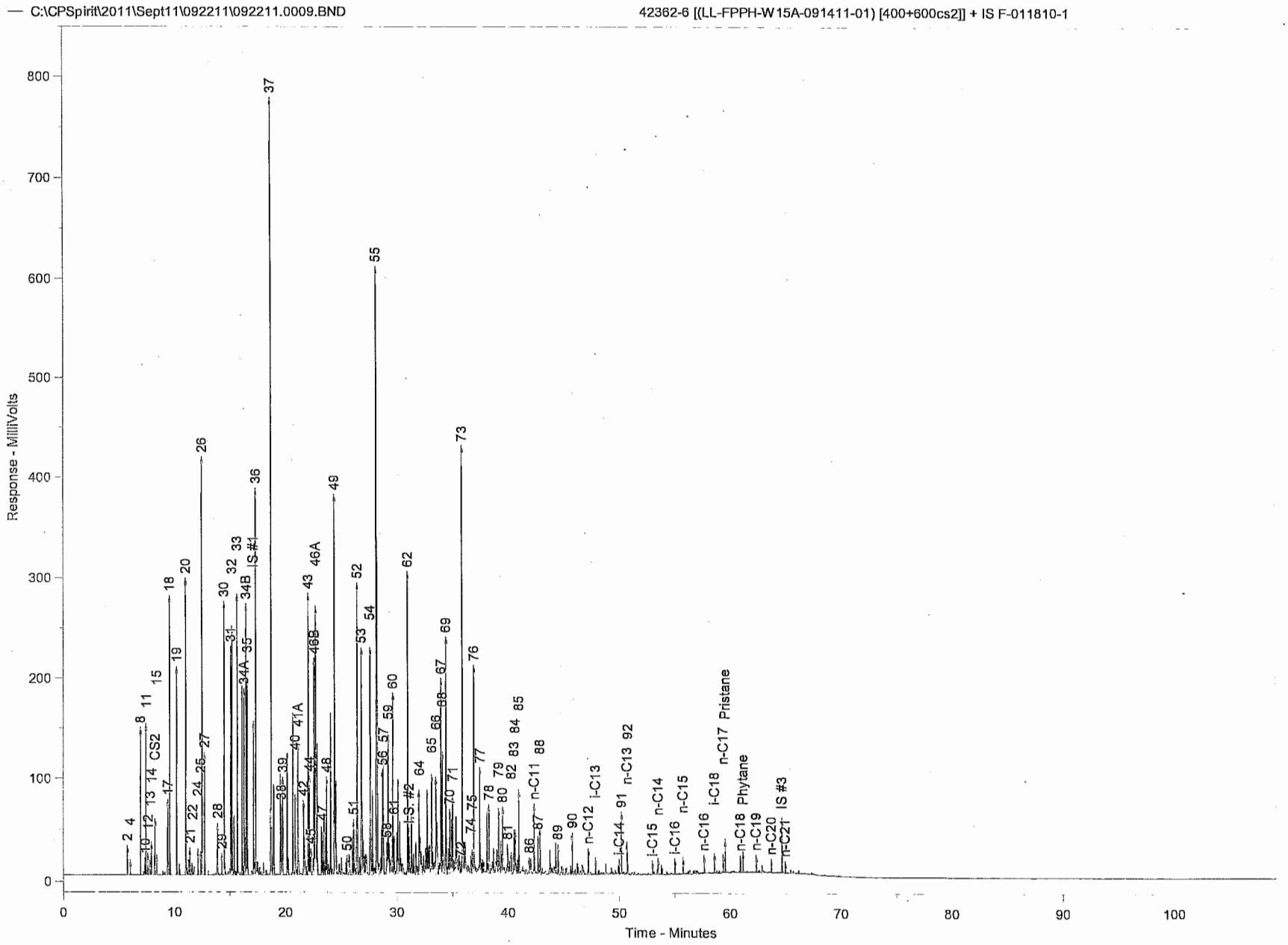
ZymaX ID		42362-6
Sample ID		LL-FPPH-W15A-091411-01
		Relative Area %
36	n-Heptane	3.06
37	Methylcyclohexane	7.25
38	2,5-Dimethylhexane	0.52
39	2,4-Dimethylhexane	0.83
40	2,3,4-Trimethylpentane	0.75
41	Toluene/2,3,3-Trimethylpentane	1.35
42	2,3-Dimethylhexane	0.61
43	2-Methylheptane	2.35
44	4-Methylheptane	0.75
45	3,4-Dimethylhexane	0.27
46A	3-Ethyl-3-methylpentane	3.30
46B	1,4-Dimethylcyclohexane	1.77
47	3-Methylheptane	0.32
48	2,2,5-Trimethylhexane	0.80
49	n-Octane	3.64
50	2,2-Dimethylheptane	0.10
51	2,4-Dimethylheptane	0.48
52	Ethylcyclohexane	2.99
53	2,6-Dimethylheptane	2.67
54	Ethylbenzene	2.54
55	m+p Xylenes	8.42
56	4-Methyloctane	0.83
57	2-Methyloctane	0.91
58	3-Ethylheptane	0.42
59	3-Methyloctane	1.18
60	o-Xylene	1.60
61	1-Nonene	0.34
62	n-Nonane	2.63
I.S.#2	p-Bromofluorobenzene	0.00
63	Isopropylbenzene	0.00
64	3,3,5-Trimethylheptane	0.76
65	2,4,5-Trimethylheptane	0.87
66	n-Propylbenzene	0.92
67	1-Methyl-3-ethylbenzene	1.71
68	1-Methyl-4-ethylbenzene	1.18
69	1,3,5-Trimethylbenzene	2.32
70	3,3,4-Trimethylheptane	0.59

ZymaX FORENSICS

9/22/2011

ZymaX ID 42362-6
Sample ID LL-FPPH-W15A-091411-01

		Relative Area %
71	1-Methyl-2-ethylbenzene	0.65
72	3-Methylnonane	0.04
73	1,2,4-Trimethylbenzene	4.02
74	Isobutylbenzene	0.13
75	sec-Butylbenzene	0.25
76	n-Decane	1.86
77	1,2,3-Trimethylbenzene	1.17
78	Indan	0.67
79	1,3-Diethylbenzene	0.55
80	1,4-Diethylbenzene	0.49
81	n-Butylbenzene	0.35
82	1,3-Dimethyl-5-ethylbenzene	0.14
83	1,4-Dimethyl-2-ethylbenzene	0.51
84	1,3-Dimethyl-4-ethylbenzene	0.44
85	1,2-Dimethyl-4-ethylbenzene	0.70
86	Undecene	0.14
87	1,2,4,5-Tetramethylbenzene	0.29
88	1,2,3,5-Tetramethylbenzene	0.34
89	1,2,3,4-Tetramethylbenzene	0.20
90	Naphthalene	0.29
91	2-Methyl-naphthalene	0.38
92	1-Methyl-naphthalene	0.09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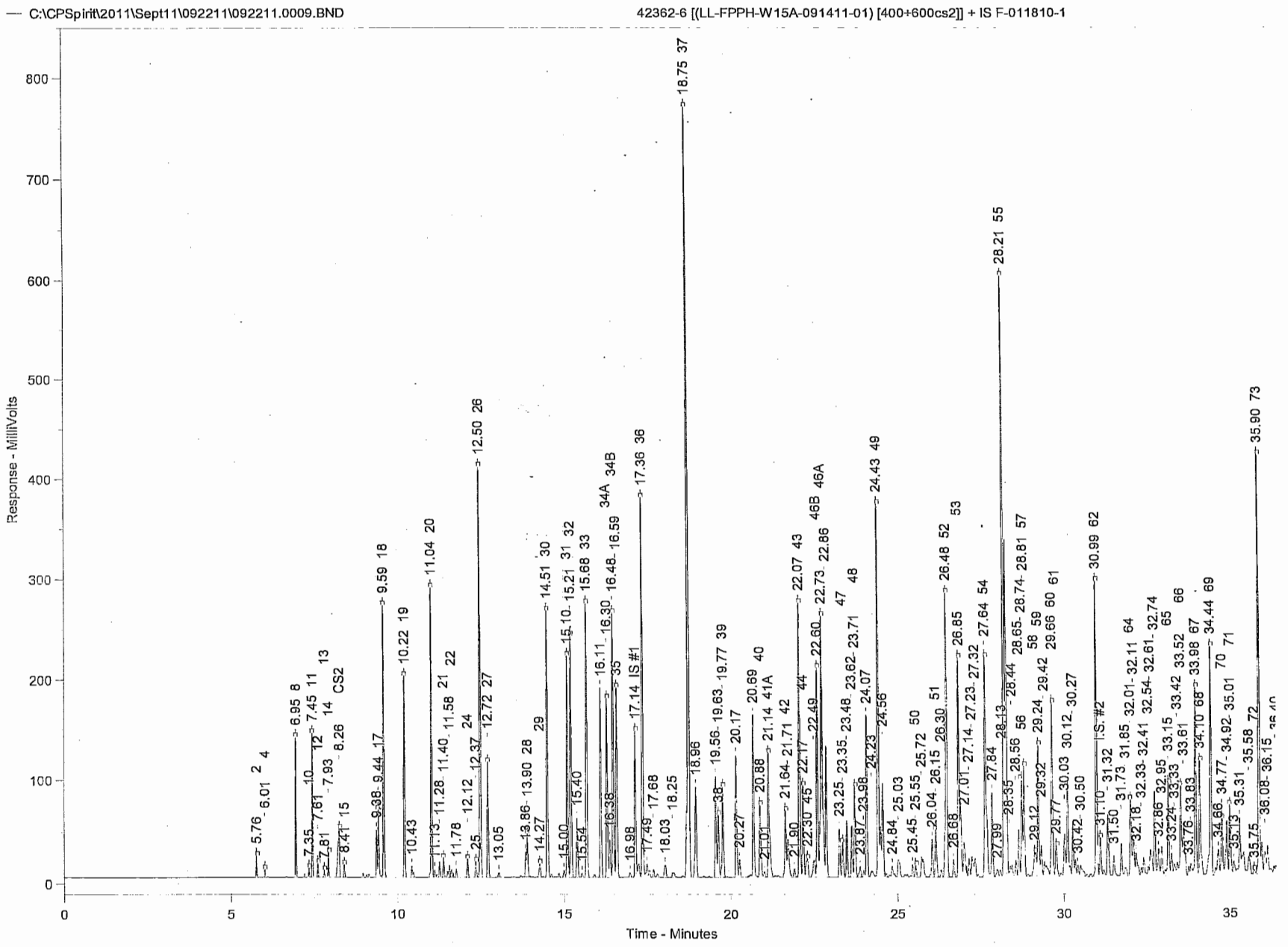
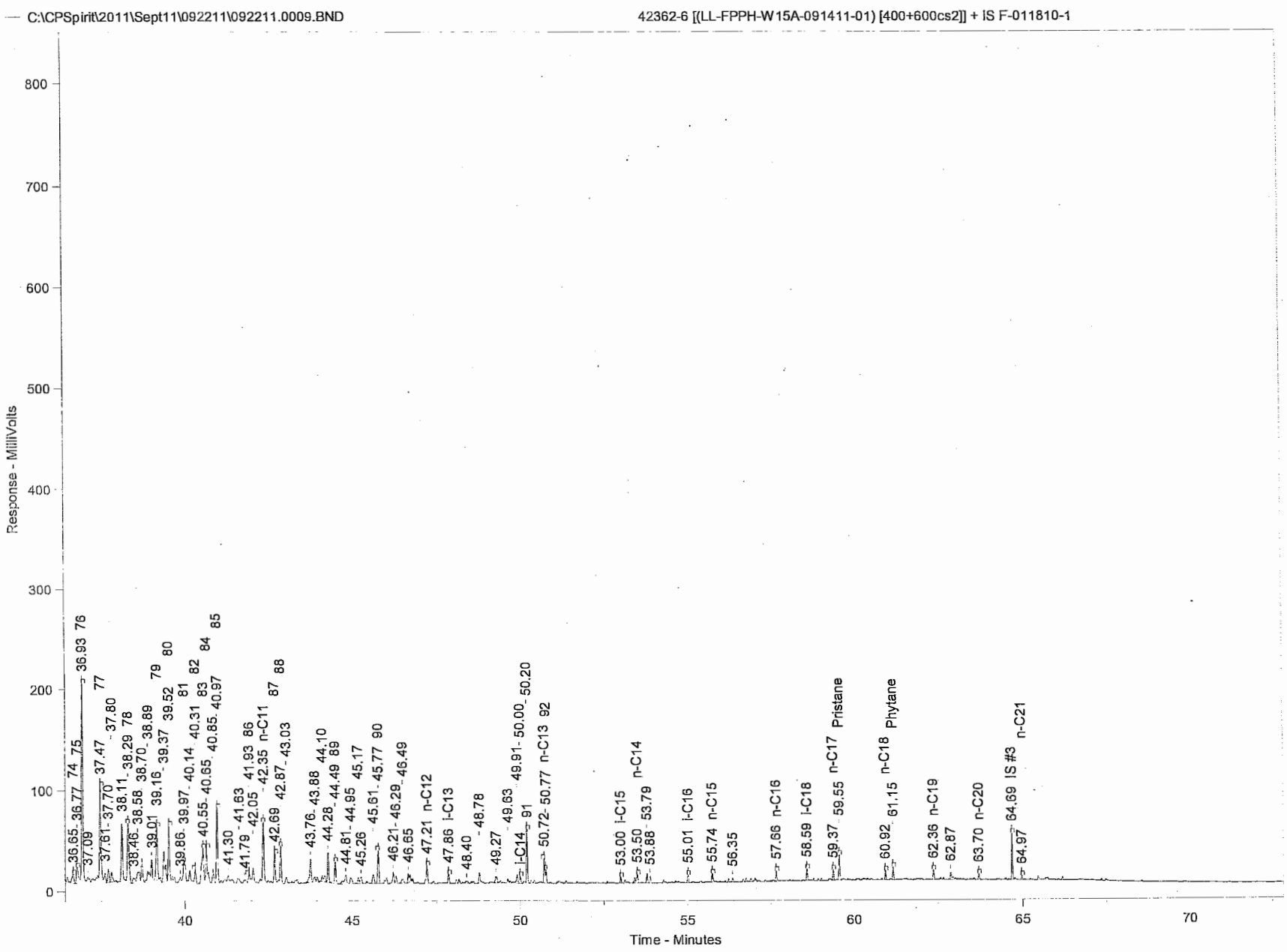
42362-6 [(LL-FPPH-W15A-091411-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
CS2
IS #1
IS #2
IS #3
Pristane
Phytane
i-C13
n-C12
i-C14
n-C13
i-C15
n-C14
i-C16
n-C15
n-C16
i-C18
n-C17
n-C18
n-C19
n-C20
n-C21
n-C11

Chrom Perfect Chromatogram Report

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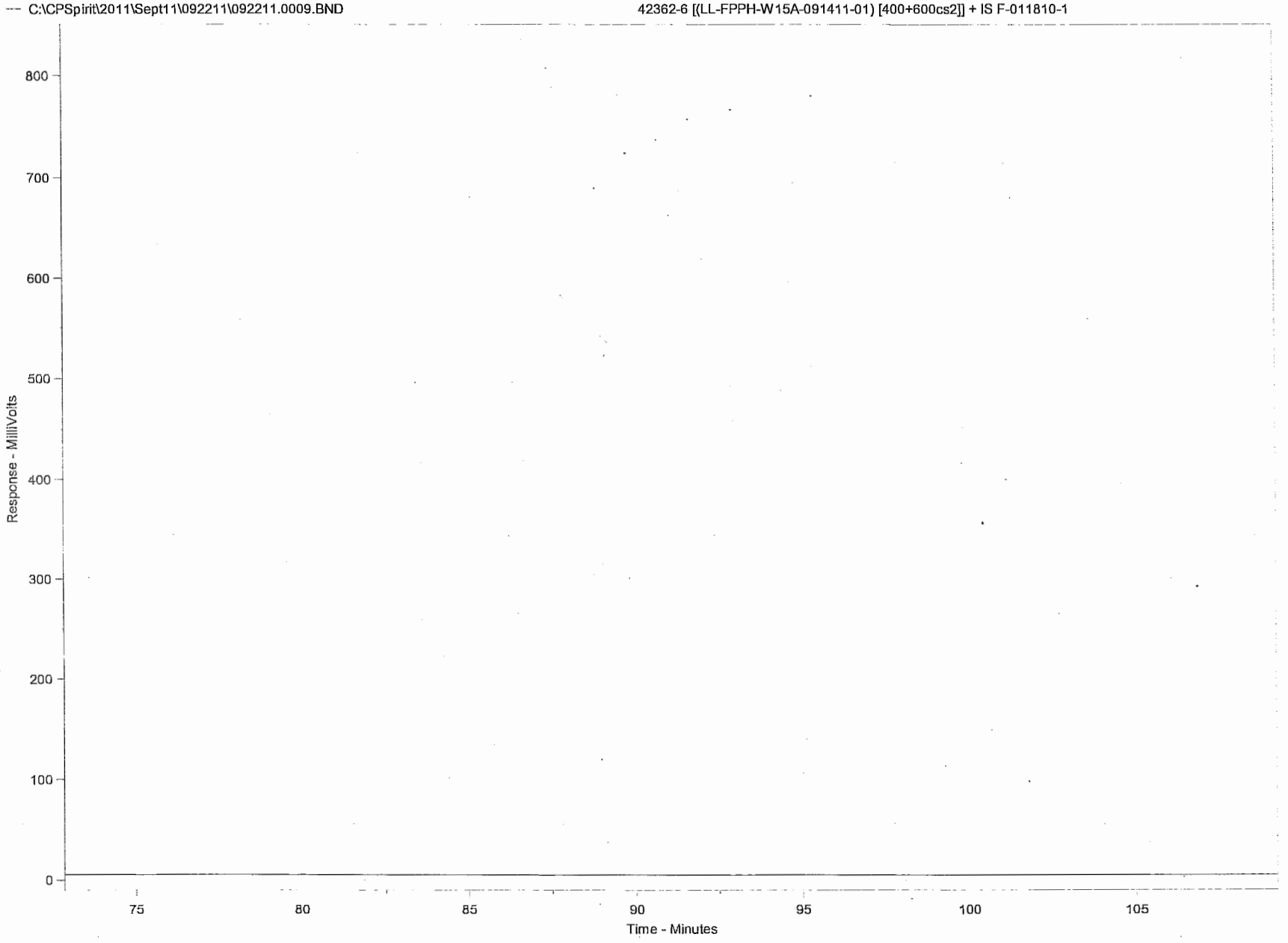
42362-6 [(LL-FPPH-W15A-091411-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
Time - Minutes
0
100
200
300
400
500
600
700
800
40
45
50
55
60
65
70
36.65
36.77
74
75
36.93
76
37.09
37.61
37.70
37.47
77
37.80
38.11
38.29
78
38.46
38.58
38.70
38.89
79
39.01
39.16
39.37
39.52
80
39.86
39.97
40.14
40.31
81
82
40.55
40.65
40.85
83
84
85
40.97
41.30
41.63
41.79
42.05
41.93
86
42.35
n-C11
87
88
42.69
42.87
43.03
43.76
43.88
44.10
44.28
44.49
89
44.81
44.95
45.17
45.26
45.61
45.77
90
46.21
46.29
46.49
46.65
47.21
n-C12
47.86
i-C13
48.40
48.78
49.27
49.63
49.91
50.00
50.20
i-C14
91
50.72
50.77
n-C13
92
53.00
i-C15
53.50
53.68
n-C14
53.79
55.01
i-C16
55.74
n-C15
56.35
57.66
n-C16
58.59
i-C18
59.37
59.55
n-C17
Pristane
60.92
61.15
n-C18
Phytane
62.36
n-C19
62.87
63.70
n-C20
64.69
IS #3
64.97
n-C21


--- C:\CPSpirit\2011\Sept11\092211\092211.0009.BND
42362-6 [(LL-FPPH-W15A-091411-01) [400+600cs2]] + IS F-011810-1
Response - MilliVolts
800
700
600
500
400
300
200
100
0
75
80
85
90
95
100
105
Time - Minutes

Sample Name = **42362-6 [(LL-FPPH-W15A-091411-01) [400+600cs2]] + IS F-011810-1**

Instrument = Instrument 1
Heading 1 =
Heading 2 =

Acquisition Port = DP#

Raw File Name = **C:\CPSpirit\2011\Sept11\092211\092211.0009.RAW**
Method File Name = C:\CPSpirit\2011\Sept11\092211\092211.0009.BND
Calibration File Name = C:\CPSpirit\2011\Sept11\092211\092211.0009.BND

Date Taken (end) = 9/23/2011 1:50:46 PM
Method Version = 44
Calibration Version = 5

Peak Name	Ret. Time	Area %	Area
2	5.76	0.0622	25966.38
4	6.01	0.0203	8466.91
8	6.95	0.4297	179399.80
10	7.35	0.0298	12433.28
11	7.45	0.4682	195457.70
12	7.61	0.0477	19905.37
13	7.81	0.0259	10799.13
14	7.93	0.0903	37695.36
CS2	8.26	0.3887	162297.90
15	8.41	0.0473	19748.38
	9.38	0.2033	84890.70
17	9.44	0.3214	134197.90
18	9.59	1.2377	516725.60
19	10.22	0.9578	399889.70
	10.43	0.0750	31303.55
20	11.04	1.4236	594352.30
	11.13	0.0347	14488.06
	11.28	0.0735	30702.68
21	11.40	0.0962	40175.25
	11.58	0.0908	37899.62
	11.78	0.0429	17893.31
24	12.12	0.0969	40458.17
25	12.37	0.0850	35474.21
26	12.50	2.1935	915782.70
27	12.72	0.6363	265668.70
	13.05	0.0261	10911.85
	13.86	0.1289	53827.52
28	13.90	0.2296	95855.87
29	14.27	0.0934	38982.18
30	14.51	1.5324	639751.40
	15.00	0.0393	16404.45
31	15.10	1.3016	543419.20
32	15.21	1.4152	590845.60
	15.40	0.3491	145751.80
	15.54	0.0218	9113.42
33	15.68	1.5971	666794.60
	16.11	1.1077	462457.10
34A	16.30	1.0548	440353.80
	16.38	0.2214	92431.59
34B	16.48	1.5843	661448.90
35	16.59	1.1826	493714.30
	16.98	0.0265	11051.64
IS #1	17.14	0.8022	334926.40
36	17.36	2.2126	923758.00
	17.49	0.0780	32543.65
	17.68	0.0422	17621.58
	18.03	0.1065	44477.43
	18.25	0.0563	23509.07
37	18.75	5.2364	2186137.00
	18.96	0.6349	265080.20
	19.56	0.5997	250368.50
38	19.63	0.3754	156730.20
39	19.77	0.6000	250484.90
	20.17	0.7492	312785.50
	20.27	0.1081	45120.65

Peak Name	Ret. Time	Area %	Area
	20.69	1.0453	436395.20
40	20.88	0.5414	226016.50
	21.01	0.0348	14513.65
41A	21.14	0.9752	407130.00
42	21.64	0.4401	183717.20
	21.71	0.3271	136551.90
	21.90	0.0537	22424.64
43	22.07	1.6995	709522.70
44	22.17	0.5436	226967.70
45	22.30	0.1944	81171.37
	22.49	0.1716	71630.55
46B	22.60	1.2812	534880.80
46A	22.73	2.3856	995983.60
	22.86	0.7865	328352.10
	23.25	0.3019	126029.80
47	23.35	0.2290	95613.39
	23.48	0.3550	148199.30
	23.62	0.3156	131757.20
48	23.71	0.5800	242132.80
	23.87	0.0844	35225.53
	23.98	0.0412	17203.60
	24.07	1.0249	427880.40
	24.23	0.0740	30892.57
49	24.43	2.6271	1096779.00
	24.56	0.5936	247814.80
	24.84	0.0797	33293.49
	25.03	0.1762	73575.27
	25.45	0.0695	28996.16
50	25.55	0.0690	28823.79
	25.72	0.2540	106039.10
	26.04	0.2520	105228.10
51	26.15	0.3470	144870.10
	26.30	0.0477	19914.37
52	26.48	2.1638	903383.10
	26.68	0.1192	49766.44
53	26.85	1.9284	805097.90
	27.01	0.3039	126864.60
	27.14	0.1102	46002.17
	27.23	0.1808	75478.24
	27.32	0.1211	50566.03
54	27.64	1.8341	765700.90
	27.84	0.5447	227403.00
	27.99	0.0728	30399.91
	28.13	0.0005	201.53
55	28.21	6.0839	2539978.00
	28.35	0.0010	408.10
	28.44	0.1405	58657.92
	28.56	0.1017	42447.69
	28.65	0.2910	121474.00
56	28.74	0.6016	251161.90
57	28.81	0.6607	275828.80
58	29.12	0.3042	127006.20
59	29.24	0.8494	354605.20
	29.32	0.2057	85870.44
	29.42	0.2102	87738.36
60	29.66	1.1576	483270.70
61	29.77	0.2454	102437.70
	30.03	0.3420	142773.50
	30.12	0.6933	289452.70
	30.27	0.3278	136870.30
	30.42	0.0668	27878.15
	30.50	0.1379	57576.71
62	30.99	1.9040	794920.70
I.S. #2	31.10	0.2701	112777.30
	31.32	0.4869	203281.00
	31.50	0.1511	63084.19
	31.73	0.2206	92082.09

Peak Name	Ret. Time	Area %	Area
	31.85	0.0864	36081.31
64	32.01	0.5528	230786.10
	32.11	0.3035	126708.00
	32.18	0.2275	94979.11
	32.33	0.0568	23702.69
	32.41	0.1448	60437.58
	32.54	0.0621	25944.41
	32.61	0.2862	119499.80
	32.74	0.5405	225636.40
	32.86	0.2117	88363.52
	32.95	0.2187	91301.50
65	33.15	0.6271	261825.50
	33.24	0.1559	65089.29
	33.33	0.1059	44215.98
	33.42	0.1056	44095.36
66	33.52	0.6652	277702.40
	33.61	0.5156	215266.90
	33.76	0.0582	24284.20
	33.83	0.1077	44968.36
67	33.98	1.2360	516005.50
68	34.10	0.8495	354651.00
69	34.44	1.6738	698816.10
	34.66	0.2791	116501.20
70	34.77	0.4270	178247.90
	34.92	0.4249	177398.00
71	35.01	0.4687	195661.80
	35.13	0.0706	29486.79
	35.31	0.2606	108815.30
	35.58	0.1489	62160.66
72	35.75	0.0319	13317.36
73	35.90	2.9073	1213750.00
	36.08	0.1919	80132.91
	36.15	0.2062	86088.52
	36.40	0.1089	45469.48
74	36.65	0.0912	38082.87
75	36.77	0.1772	73983.93
76	36.93	1.3409	559820.90
	37.09	0.0776	32408.17
77	37.47	0.8474	353791.30
	37.61	0.0823	34358.79
	37.70	0.0867	36184.38
	37.80	0.0789	32952.63
	38.11	0.4094	170904.00
78	38.29	0.4850	202481.30
	38.46	0.0664	27740.50
	38.58	0.1387	57916.40
	38.70	0.1641	68492.98
	38.89	0.1485	61991.54
	39.01	0.1312	54780.85
79	39.16	0.3945	164707.80
	39.37	0.3042	126999.10
80	39.52	0.3556	148444.60
	39.86	0.0554	23110.27
81	39.97	0.2564	107050.40
	40.14	0.0959	40032.52
82	40.31	0.0990	41314.36
83	40.55	0.3671	153275.70
84	40.65	0.3199	133568.10
	40.85	0.1054	44020.81
85	40.97	0.5080	212079.50
	41.30	0.1294	54007.90
	41.63	0.0753	31433.92
	41.79	0.0569	23743.00
86	41.93	0.0998	41659.52
	42.05	0.1415	59079.16
n-C11	42.35	0.4827	201502.60
87	42.69	0.2090	87240.66

Peak Name	Ret. Time	Area %	Area
88	42.87	0.2479	103508.40
	43.03	0.0542	22617.58
	43.76	0.1802	75212.40
	43.88	0.0394	16453.84
	44.10	0.0817	34121.80
	44.28	0.1919	80108.21
89	44.49	0.1459	60906.32
	44.81	0.1122	46836.91
	44.95	0.0619	25853.26
	45.17	0.0423	17648.62
	45.26	0.0508	21198.49
	45.61	0.0751	31340.36
90	45.77	0.2105	87868.23
	46.21	0.0846	35321.56
	46.29	0.0477	19919.06
	46.49	0.0523	21838.20
	46.65	0.0862	35979.67
n-C12	47.21	0.1318	55032.63
i-C13	47.86	0.0588	24544.17
	48.40	0.0240	10017.39
	48.78	0.0666	27823.84
	49.27	0.0582	24284.48
	49.63	0.0388	16195.13
	49.91	0.0584	24379.92
i-C14	50.00	0.0379	15823.59
91	50.20	0.2724	113720.60
n-C13	50.72	0.1220	50915.29
92	50.77	0.0636	26547.98
i-C15	53.00	0.0301	12575.21
n-C14	53.50	0.0952	39762.20
	53.79	0.0491	20483.68
	53.88	0.0360	15021.59
i-C16	55.01	0.0432	18016.60
n-C15	55.74	0.0501	20902.33
	56.35	0.0204	8511.69
n-C16	57.66	0.0513	21402.68
i-C18	58.59	0.0604	25213.19
n-C17	59.37	0.0507	21186.95
Pristane	59.55	0.1349	56312.31
n-C18	60.92	0.0415	17345.52
Phytane	61.15	0.0637	26577.55
n-C19	62.36	0.0553	23080.19
	62.87	0.0483	20182.78
n-C20	63.70	0.0298	12443.04
IS #3	64.69	0.1981	82720.46
n-C21	64.97	0.0193	8060.67

Total Area = 4.174906E+07 Total Height = 1.460286E+07 Total Amount = 2